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ERRATA

NSA, Vol. 4, No. 24B, page 1019. Hall, T. refers to Hall, Thomas, and Hall, T. A., refers to Hall, Theodore A. The number 4-5765 should be moved from the former to the latter. On page 1036, the number 4-1233 for Marshall, J. F., should be 4-1223.

In NSA 5-1546(1951), the report number (NRL-3680) was omitted from the descriptive cataloging.

In NSA 5-1679(1951), the report number (BNL-71) was omitted from the descriptive cataloging.

NSA, Vol. 4, No. 8, p.280. In abstract 1750, line 7, μg/ml should be units/ml.

NSA, Vol. 4, No. 8, p.F. Delete the entire entry for UCRL-579.

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ANL-4401(p.14-29)	A Note on Exponential Fitting of Empirical Curves (abstract), p.14-29 of Biological and Medical Divisions; Quarterly Report, November, December, January, 1949-50. W. Feurzeig and S. A. Tyler.	2011
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ANL-4401(p.116-19)	Progress Report; Cytology and Cytochemistry, p.116-19 of Biological and Medical Divisions; Quarterly Report, November, December, January, 1949-50. Austin M. Brues, Agnes Naranjo Stroud, and George Svihla.	2014
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ANL-4401(p.143)	Progress Report; Study of the Thyroid-Pituitary Axis of the White Leghorn Fowl Using I^{131}, p.143 of Biological and Medical Divisions; Quarterly Report, November, December, January, 1949-50. David M. Morris.	2101
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ANL-4401(p.170)	Preliminary Report; Effect of Temperature on Inactivation of Bacteriophage by X Rays, p.170 of Biological and Medical Divisions; Quarterly Report, November, December, January, 1949-50. C. S. Bachofer, C. F. Ehret, and S. Mayer.	2042
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ANL-4474(p.19-23)	Clotting Time Changes after Total-Body X Irradiation, p.19-23 of Progress Report; Abnormal Bleeding. J. G. Allen, L. J. Savage, P. V. Moulder, and D. M. Enerson.	2044
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CEA-33	Note on the Decay of Fission Products Having the Same Mass Number. Bull. soc. chim. France (5) 14, 968-9(1947). J. Gueron.	2274
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CEA-57	Concerning Differential Polarography with a Single Dropping Electrode. J. chim. phys. 47, No. 7-8(1950). (In French) P. Leveque and F. Roth.	2123
NEPA-1511	Summary Report on Stress Rupture and Creep Testing of Coated and Uncoated Graphite and Beryllium Carbide at Elevated Temperatures; July 1948 to July 1950. B. Zweig and M. D. Burdick.	2137
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NP-1860(p.5-16)	Gamma Rays from $Be^{9}(\alpha,n)$, p.5-16 of Progress Report; Nuclear Physics. James Terrell.	2271
NP-1860(p.17-24)	The High Energy Neutrons from the Disintegration of C^{13} by Deuterons, p.17-24 of Progress Report; Nuclear Physics. J. E. Richardson.	2234
NP-1860(p.25-30)	Stabilization of Magnetic Field by Means of Proton Magnetic Resonance, p.25-30 of Progress Report; Nuclear Physics. R. D. Jones.	2202
NP-1898	Nuclear Shielding Studies; VII. The Effect of Ducts on the Attenuation of Neutrons and Gamma Rays in the M.I.T. Cyclotron Shield; Technical Report No. 38. J. W. Crawford, Jr., E. E. Kintner, and Clark Goodman.	2263
NP-1923	Research on the Element Silicon and Silicon Alloys; Bimonthly Report No. 5; July 16 – September 15, 1950. William R. Johnson and M. Hansen.	2178
NP-1926	Subject Index to Radioisotope Research and Techniques; (Including Use of Radioactive Calcium, Fluorine, Phosphorus, Sodium, and Strontium). Elizabeth Jennings.	2026
NP-1930	Technical Report No. 1. W. E. Stephens.	2247
1930(paper 1)	Thresholds of Photo-Neutrons Reactions, paper 1 of Technical Report No. 1. R. Sher, J. Halpern, and W. E. Stephens.	2248
NP-1930(paper 2)	Photodisintegration of Copper, paper 2 of Technical Report, No. 1. P. R. Byerly, Jr., and W. E. Stephens.	2249
NP-1930(paper 3)	Photo Production of N^{17}, paper 3 of Technical Report No. 1. W. E. Stephens, J. Halpern, and R. Sher.	2250
NP-1930(paper 4)	Excitation Function of the Reaction $C^{12}(\gamma,p)B^{11}$, paper 4 of Technical Report No. 1. A. K. Mann and J. Halpern.	2251
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NP-2192	Electrodes of Solid Metals Replacing the Mercury Drop Electrode; trans. from Zavodskaya Lab. 14, No. 2 (1948).	2124
NP-2205	Report on Activities of the Swedish Atomic Committee, 1945 – 1949.	2008
NP-2231	Investigation into the Angular Correlation of Internal Conversion Factors; trans. from Doklady Akad. Nauk S.S.S.R. 68, 1029-32(1949). L. I. Rusinov, and Ye I. Chuykin.	2273
NP-2232	Electrolytic Separation of Zirconium; trans. from Zhur. Priklad. Khim. 19, No. 8 (1946). V. A. Plotnikov and E. B. Gitman.	2172
NP-2238	Negative Ions of Rubidium and Cesium; trans. from Doklady Akad. Nauk S.S.S.R. 68, 31-2(1949). V. M. Dukelskii, E. Ya Zandberg, and I. I. Ionov.	2214
NRL-3679	A Device for Computing Correlation Functions. A. E. Hastings and J. E. Meade.	2198

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TT-140	The Use of Tagged Atoms in the Study of the Phenomena of Adsorption and Catalysis; trans. from Uspekhi Khim. 19, 59-87(1950). N. P. Keier, tr. by E. Rabkin.	2158

GENERAL

ATOMIC BOMBS AND WARFARE

2004

THE EFFECTS OF ATOMIC WEAPONS. Los Alamos Scientific Laboratory. Washington, U. S. Government Printing Office, revised Sept. 1950. 456p.

A technical summary of results to be expected from the detonation of atomic weapons is presented. Representative groups of scientists contributed to the following phases of the book: shock waves and blast damage, thermal radiation and incendiary effects, nuclear radiation and instrumentation, effects on personnel, protection of personnel, and miscellaneous material.

ATOMIC POWER

2005

ECONOMIC ASPECTS OF ATOMIC POWER. S. H. Schurr and J. Marschak. Princeton, Princeton University Press, 1951. 290p.

This exploratory study of peacetime applications of atomic power is the first comprehensive approach to this important and controversial subject. It presents an analytical study of the potential applicability of atomic power in several industries, with a chapter on iron and steel. An outline estimate of the economic effects is presented; an economic comparison is made for various areas of the world between electricity generated from atomic heat and that produced by other means. This review also appears in Iron Age 167, 82(1951) Mar. 22.

2006

A GENERAL LECTURE ON ATOMIC ENERGY COVERING THE WHOLE FIELD. Sir John Cockcroft. Assoc. Sci. Tech. Soc. S. Africa, Ann. Proc., 43-59(1948-1949).

Phenomena of the release of nuclear energy by fusion of light nuclei or splitting of heavy nuclei are covered. Reactors, isotope separation, production of radioactive isotopes, chemical separation, nuclear power, and military consequences of atomic energy are discussed.

RESEARCH PROGRAMS

2007

THE IMPACT OF ATOMIC ENERGY ON EDUCATION. Russell S. Poor. Virginia J. Sci. (New series) 1, 177-90 (1950) July.

Use of radioisotopes by 12 educational institutions in southern states, reeducation of mankind with relation to the potentialities of atomic energy, and exploitation of peacetime values of atomic energy are indicated as activities having educational implications. The changes in subject matter in the fields of physics, chemistry, biology and medicine, engineering, metallurgy, and geology are discussed. A description and discussion of the educational scope and services of the Oak Ridge Institute of Nuclear Studies, chartered as a nonprofit educational organization on October 16, 1946 with 24 sponsoring universities, are included.

2008

Sweden

REPORT ON ACTIVITIES OF THE SWEDISH ATOMIC COMMITTEE, 1945-1949. June 1950. 110p. (NP-2205)

In the introductory chapter the principal facts which give atomic energy problems their special character, and which furnish the reasons for the special status in technical and scientific research which atomic energy research has come to hold are discussed. The following chapter reports on the organization developments in Sweden, and on that part of the research work which is being done with funds from the appropriation for atomic energy research, particularly in the natural sciences. The research and activities more directly aimed at a specific goal are finally reported on briefly.

BIOLOGY AND MEDICINE

2009

Argonne National Lab.

BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-1950. Austin M. Brues, Director. [nd.] 193p. (ANL-4401)

Separate abstracts have been prepared on the following sections of this report: On the Determination of Retention Behavior and Total Metabolic Excretion of Radioisotopes from Daily Excretion Data (Abstract), p.12-13; A Note on Exponential Fitting of Empirical Curves (Abstract), p.14-

29; Phenylhydrazine Stimulation of Erythropoiesis in Refractory Anemia (Abstract), p.30; Further Studies on Factors Influencing Recovery from Radiation Injury (Abstract), p.31-2; The Effect of Spleen Protection on Iron Distribution in Irradiated Rats (Abstract), p.33-4; Progress Report: Chronic External Irradiation, p.35-7; Summary of Finished Experiments. Part I. Survival and Blood Picture of Hybrid Guinea Pigs Exposed to Long-continued Total-body γ Radiation, p.38-52; Summary of Finished Experiments. Part II. Recovery from Anemia Induced in Guinea Pigs by a Limited Exposure to Chronic Total-body γ Radiation, p.53-71; Progress Report: Notes on the Evaluation of Materials That Might be Expected to Alter Radiosensitivity, p.72-4; Progress Report: The Effect of X Rays on the Oxidizable Sulfhydryl Groups of Rats Receiving Cysteine, p.75-7; Progress of the Long-term Polonium-Mouse Experiment, p.78-95; Progress Report: Method of Preparation of Connective Tissue for Electron Micrography and a Preliminary Report on Some Observations Made by Using This Method, p.96-115; Progress Report: Cytology and Cytochemistry, p.116-19; Oxidase Increase in Melanoplus differentialis Eggs Caused by X Irradiation (Abstract), p.120; A New Method for Staining Cells with Cobalt and BAL (Abstract), p.121-4; Progress Report: Influence of Dosage Rate on X-ray Effects in Young Chicks and Rats, p.125-9; Preliminary Report: Cysteine Protection of Tumor Fragments in Vitro from Irradiation with Lethal Dosages of X Rays, p.130-42; Progress Report: A Study of the Thyroid-Pituitary Axis of the White Leghorn Fowl Using I^{131}, p.143; Progress Report: Phytoradiology, p.144-51; Progress Report: Radiobiology Experiment Station, p.152-4; Progress Report: The Determination of Maximum Energy of β Radiation by the Orthogonal Polynomial Method, p.155-63; Preliminary Report: Hydrogen Peroxide Formation on X Irradiation of Water with Hard and Soft X Rays, p.164-6; The Effect of X Irradiation on Cytochrome C (Abstract), p.167; Preliminary Report: Magnitude of Mating Response as a Function of Irradiance in Paramecium bursaria, p.168-9; Preliminary Report: Effect of Temperature on Inactivation of Bacteriophage by X Rays, p.170; Progress Report: Radiobiochemistry, p.171-3; Some Late Histological Changes in Mice After Low Doses of Plutonium and Radium, p.174-84.

2010

Argonne National Lab.
ON THE DETERMINATION OF RETENTION BEHAVIOR AND TOTAL METABOLIC EXCRETION OF RADIOISOTOPES FROM DAILY EXCRETION DATA (abstract), p.12-13 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. Sylvanus A. Tyler and Joan Gurian. [nd.] 2p. (ANL-4401 (p.12-13))

Excretion data are described by sums of exponentials, and the total excreted material is approximated. The corresponding retention function is derived.

2011

Argonne National Lab.
A NOTE ON EXPONENTIAL FITTING OF EMPIRICAL CURVES (abstract), p.14-29 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. W. Feurzeig and S. A. Tyler. [nd.] 16p. (ANL-4401(p.14-29))

A method of fitting empirical data by sums of exponentials is illustrated by employing it to describe three sets of data typical of many biological experimental results.

2012

Argonne National Lab.
PHENYLHYDRAZINE STIMULATION OF ERYTHROPOIESIS IN REFRACTORY ANEMIA (abstract), p.30 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. L. O. Jacobson, C. L. Pope, M. H. Block, and W. F. Bethard. [nd.] 1p. (ANL-4401(p.30))

Acetyl phenylhydrazine or phenylhydrazine hydrochloride was administered daily by mouth in a dose of from 0.1 to 0.2 g to patients suffering from disease of varied etiology but who had in common an anemia refractory to such therapeutic agents as iron and liver and who were thus dependent on transfusions. The disease states studied included acute myelogenous leukemia, chronic myelogenous and lymphatic leukemia, subacute myelogenous leukemia, Hodgkin's disease, lymphosarcoma, carcinomatosis, and refractory anemia with a hyperplastic erythroblastic marrow. In all patients to whom phenylhydrazine was administered, urinary and fecal urobilinogen excretion was extremely high. The data indicate that phenylhydrazine, the hemolysis induced by phenylhydrazine, or the products of hemolysis may stimulate erythrocytopoiesis in individuals with refractory anemia associated with neoplastic disease. Studies are in progress to determine more precisely the nature of the stimulus.

2013

Argonne National Lab.
PROGRESS REPORT; METHOD OF PREPARATION OF CONNECTIVE TISSUE FOR ELECTRON MICROGRAPHY AND A PRELIMINARY REPORT ON SOME OBSERVATIONS MADE BY USING THIS METHOD, p.96-115 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. F. Wassermann. [nd.] 20p. (ANL-4401(p.96-115))

The technique of spreading pieces of a preformed connective-tissue membrane (subcutaneous fascia of the mouse) on the slide, followed by fixation and dehydration, was found to produce preparations that are, in part, thin enough for electron microscopy. Details such as the cross banding of the collagenous fibers, which were discovered by electron microscopy, are clearly shown in the photographs. The advantage of this preparation is that the study is not limited to isolated fibers or fiber bundles but comprises the entire connective tissue, i.e., collagenous and elastic fibers, the ground substance, and the cells. It is expected that electron microscope studies of the connective tissue will lead to a better understanding of the effects of radiation on this important tissue. 14 figures.

2014

Argonne National Lab.
PROGRESS REPORT; CYTOLOGY AND CYTOCHEMISTRY,

p.116-19 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. Austin M. Brues, Agnes Naranjo Stroud, and George Svihla. [nd.] 4p. (ANL-4401(p.116-19))

Experiments are in progress to determine the effects of various agents on the duration of the phases of mitosis and on cell behavior. Observations have been made using phase-contrast ciner atographs and stained preparations of treated cultures of 10-day chick embryo muscle fibroblasts. Colchicine, in doses ranging from 0.4×10^{-7} to 0.67×10^{-7}M, was applied to tissue cultures that had grown for 24 hr, the time at which mitosis for the normal fibroblasts is at its maximum. During the delayed metaphase the chromosomes became thicker than usual but moved independently from prephase to the equatorial plate and appeared to attach themselves to a central axis and rotate around it, shifting from one end of the cell to the other. Other results are described.

2015

Argonne National Lab.
A NEW METHOD FOR STAINING CELLS WITH COBALT AND BAL (abstract), p.121-4 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. Theodore N. Tahmisian and Austin M. Brues. [nd.] 4p. (ANL-4401(p.121-4))

Cobalt (5%) when used as a mordant forms a colorless complex salt with the tissue constituents. The loci of cobalt complexes are rendered visible by developing them to a dark brown with BAL (2,3-mercaptopropanol). Since a large amount of sulfur is present in the protoplasm and since cobalt has a high affinity for sulfur, it is believed that the original complex formed when the tissue is mordanted in cobalt is a cobalt-sulfur complex. Another reason for believing that a cobalt-sulfur complex is formed is that a tissue treated as though prepared for a -SH test renders a better color. Compounds containing one -SH group do not form any color when cobalt is added unless the pH of the compound is 8.5 or higher. When a compound containing 2 or more -SH groups is added to cobalt a brown color is obtained immediately. H_2S and cobalt form a black sulfide. This staining method is very useful for the fibrillar portions of the cytoplasm, especially for the staining of the mitotic spindle and centrioles. This is not a method for testing for the presence of -SH groups.

2016

Argonne National Lab.
PROGRESS REPORT; RADIOBIOCHEMISTRY, p.171-3 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. Jack Schubert. [nd.] 3p. (ANL-4401(p.171-3))

A procedure has been developed for the isolation and quantification of Ra from volumes of urine exceeding 500 ml and from animal tissues. Recoveries have been higher than 95% and less than 1 disintegration per minute can be determined with accuracy from large amounts of biological material. A method for the determination of H^3 in urine and other biological fluids has been developed. Using this technique, measurable amounts of H^3 have been found in 0.1 ml of urine from exposed individuals. An investigation of the dissociation constants of metabolically important, complex compounds is under way in an effort to find means of removing radioelements from the body. It was found that salts of Ti, Fe, and Mn, as well as zirconium citrate, injected 1 hr after the introduction of Pu, are effective in reducing the Pu content in bone. Injection of Zr prior to the injection of Pu resulted in a 3-fold reduction in deposition. The number of days over which such an injection of Zr will minimize bone deposition of Pu is a function of the amount of Zr administered. Orally administered Zr had no effect on Pu or Y metabolism. Studies with mice indicate that the deposition of Pu is independent of age while those with Sr show that deposition is higher in young animals than in adults. Pu is taken up by a nearly irreversible physical adsorption while Sr is taken up by a chemical (ion) exchange. The metabolism of Pb has been found to be unaffected by either sodium citrate or zirconium citrate.

2017

Argonne National Lab.
PROGRESS REPORT; ABNORMAL BLEEDING. J. Garrott Allen. March 1950. 167p. (ANL-4474)

Separate abstracts have been prepared on the following sections of this report: An Evaluation of the in Vitro Clotting Time of Whole Blood, p.5-18; Clotting Time Changes after Total-Body X Irradiation, p.19-23; Independence of Protamine Titration and Platelet Level in Certain Hemorrhagic Diseases, p.24-33; Some Observations on the Relationship of Heparin to Protamine Sulfate and the Blood Platelets, p.34-59; Aminopterin in Normal Dogs, p.60-8; The Antiheparin Activities of Protamine Sulfate, Gelatin, Lysine, and Toluidine Blue, p.69-87; Plasma Antithrombin in Irradiated and Heparinized Dogs, a Preliminary Study, p.88-98; Physical Phenomena in Blood Coagulation, p.99-111; Further Studies on the Isolation of Heparin from Blood of Irradiated Dogs, p.112-22; in Vivo Changes in the Ultraviolet Absorption Spectrum of Dog Plasma Following Exposure to X Irradiation, p.122-27; Correlated Studies on the Irradiated Dog, p.128-47; Summary of Irradiation Effects on the Blood Coagulation Mechanism, p.148-67.

2018

Argonne National Lab.
AN EVALUATION OF THE IN VITRO CLOTTING TIME OF WHOLE BLOOD, p.5-18 of PROGRESS REPORT; ABNORMAL BLEEDING. J. G. Allen, P. V. Moulder, and D. M. Enerson. March 1950. 14p. (ANL-4474(p.5-18))

Data presented in this paper suggest that the normal in vitro whole-blood clotting time is primarily a function of the quantity of thromboplastin produced at venepuncture and of the type of surface the blood contacts. 11 references.

2019

Argonne National Lab.
INDEPENDENCE OF PROTAMINE TITRATION AND PLATELET LEVEL IN CERTAIN HEMORRHAGIC DISEASES, p.24-33 of PROGRESS REPORT; ABNORMAL BLEEDING. P. V. Moulder and J. G. Allen. March 1950. 10p. (ANL-4474(p.24-33))

The platelet concentration influences the sensitivity of blood and plasma to the effect of added heparin. The anti-

coagulant potency of heparin is also enhanced by prothrombin deficiency. The potentiated effect of heparin in thrombocytopenic blood may be due to reduced thromboplastin (cephalin) activity. The protamine titration may be increased when the platelet count is normal and it may be normal in the presence of thrombocytopenia. It is influenced by heparin, heparinoid substances, prothrombin deficiency, hemophilia, and possibly other factors. Increased protamine titrations may occur in bleeding patients who have no other apparent clotting defects, including the whole-blood clotting time. Many of these patients cease bleeding when given intravenous injections of toluidine blue, following which the protamine titration may be returned to or toward normal regardless of the platelet level. (auth)

2020

Argonne National Lab.
AMINOPTERIN IN NORMAL DOGS, p.60-8 of PROGRESS REPORT; ABNORMAL BLEEDING. B. J. Grossman, M. H. Sanderson, and J. G. Allen. March 1950. 9p. (ANL-4474 (p.60-8))

Ten dogs were given intramuscular injections of 0.5 mg of aminopterin daily for varying periods of time that ranged from 4 to 16 days. One dog was given 1.0 mg of aminopterin daily for 7 days and another received a daily dose of 1.5 mg for 3 days. The following studies were made on each animal: erythrocyte, leukocyte, and thrombocyte counts; differential leucocyte counts; differential leucocyte counts; whole-blood clotting times; prothrombin activity; protamine titrations; and gross observations for evidence of clot retraction and fibrinolysis. Observations disclosed at least two possible explanations for the hemorrhage occurring in the normal dog given aminopterin. One was a general effect that was manifested by an increase in the protamine titration and frequently by a mildly prolonged clotting time. The defect(s) seemed amenable to the administration of adequate amounts of toluidine blue and/or protamine sulfate. The second was a local effect in which capillary denudation occurred as result of gastrointestinal desquamation.

2021

Argonne National Lab.
THE ANTIHEPARIN ACTIVITIES OF PROTAMINE SULFATE, GELATIN, LYSINE, AND TOLUIDINE BLUE, p.69-87 of PROGRESS REPORT; ABNORMAL BLEEDING. J. G. Allen, M. H. Sanderson, W. M. Egner, K. A. Lathrop, D. M. Enerson, and P. V. Moulder. March 1950. 19p. (ANL-4474(p.69-87))

Antiheparin activity may be detected for protamine sulfate, toluidine blue, or polygelatin, and lysine. This can be demonstrated in vitro and in vivo with protamine and toluidine blue but only in vivo with gelatine and lysine. The antiheparin action of protamine sulfate, while prompt and effective, lasts for less than 2 hr while that of toluidine blue is slow but lasts from 12 to 24 hr. Gelatin and lysine last 12 to 24 hr. The rapid inactivation of protamine probably explains why this substance is less effective than toluidine blue in the treatment of "heparinoid" bleeding. The amino acid, *dl*-lysine, is a mild antiheparin when given orally and parenterally. It is more physiologic than toluidine blue and it is less toxic than protamine sulfate. 10 references. (auth)

2022

Texas Agricultural Experiment Station
ROUTES OF ABSORPTION OF FREE FATTY ACIDS AND TRIGLYCERIDES FROM THE INTESTINE. Raymond Reiser and Melvin J. Bryson. [nd.] 9p. (ORO-9)

Trilinolein prepared from 10,12-linoleic acid, and a mixture of free 10,12-linoleic acid and Wesson Oil were fed to rats provided with thoracic duct cannulae. It was found that the lymph fat always contained somewhat less of the conjugated acid than did the fat ingested, but that there was as much or more in the lymph after free-acid ingestion as after glyceride ingestion. It is concluded that in whatever form fed, free fatty acids are absorbed by the same route as triglycerides.

2023

Atomic Energy Project, Univ. of California, Los Angeles
THE EFFECT OF HISTAMINE AND ANTIHISTAMINICS ON THE COAGULATION OF NORMAL AND HEPARINIZED RABBIT PLASMA. Thomas J. Haley and Frances Stolarsky. Dec. 21, 1950. 10p. (UCLA-102)

The effects of histamine and a large number of antihistaminic drugs upon the coagulation of normal and heparinized rabbit plasma have been investigated. It has been established that the amount of each compound required for an antiheparin effect is critical. At concentrations below the critical level the drugs have little or no effect upon the coagulation system studied. At concentrations above this level several of the antihistaminics as well as histamine produced a progressively increased incoagulability of the system. This anticoagulant effect is related to concentration and the action is on some substance other than heparin. Thenfadil, methapyrilene, and thonzylamine had no effect upon normal or heparinized plasma. Of all the compounds tested, 194-B, methaphenilene, pyranisamine, 204, phenazoline, tripelennamine, diphenhydramine, pyrathiazine, RD-AH-853 and *p*-Fluorobenzyl D.P.E. gave the best results in that, upon reaching the critical concentration for heparin inactivation, they did not become anticoagulants themselves. It has been postulated that the antiheparin activity of these compounds is due to their direct combination with heparin. (auth)

2024

Crocker Lab., Univ. of California
THE ROLE OF CYCLOTRON IN MEDICAL RESEARCH. Joseph G. Hamilton. Apr. 19, 1950. 19p. (UCRL-925)

A discussion of radioisotopes obtained from cyclotrons and their application in medicine is presented. It is indicated that the chain-reacting pile and the cyclotron are not competitive devices for the production of radioisotopes, but that they complement each other. Radioisotopes which either cannot be produced in a chain-reacting pile or are preferably made by a cyclotron for use in medical research are listed. Radioautographs showing results of medical applications of radioisotopes and a photograph of the 60-in. medical cyclotron in the Crocker Laboratory are included.

2025

Atomic Energy Project, Univ. of Rochester
MANIFOLD EFFECTS OF 2,4-DINITROPHENOL ON THE METABOLISM OF LIVING YEAST CELLS. A. Rothstein and H. Berke. Nov. 7, 1950. 25p. (UR-143)

The action of DNP (2,4-dinitrophenol) on intact yeast cells is complex, involving a number of different effects. Over a wide range of concentrations, DNP decreases the storage of reserve CHO (carbohydrate) at least in part by inducing a more rapid dissimilation. With low concentrations of DNP, the enhanced dissimilation proceeds through aerobic pathways, with a consequent stimulation of respiration. With high concentrations of DNP, the respiration is inhibited and the dissimilation proceeds through anaerobic pathways, with a consequent appearance of an endogenous alcoholic fermentation. The stored CHO utilized in DNP-induced fermentation is not the same as that utilized in DNP-enhanced respiration. Superimposed on the stimulatory effects of DNP on endogenous metabolism are inhibitory effects of DNP on exogenous metabolism, both respiration and fermentation. The respiration of glucose is more sensitive to DNP than is the fermentation. Consequently, at some concentrations of DNP, there is a marked rise in the R.Q. and a simultaneous stimulation of aerobic fermentation. At higher concentrations of DNP, however, the fermentation is also inhibited. Uranyl ion can be used to differentiate some of the metabolic pathways. The DNP-enhanced endogenous respiration is sensitive to UO_2^{++}, but the normal endogenous respiration and the DNP-induced endogenous fermentation are not. 24 references. (auth)

2026

George Williams Hooper Foundation for Medical Research and California Univ.
SUBJECT INDEX TO RADIOISOTOPE RESEARCH AND TECHNIQUES. (Including Use of Radioactive Calcium, Fluorine, Phosphorus, Sodium and Strontium.) Elizabeth Jennings. [nd.] 113p. (NP-1926)

Subject headings and divisions cover the following: general use of radioisotopes in biology, medicine, and dentistry; health physics; instruments; methods; nuclear physics; radiocalcium; radiochemistry; radiochemical laboratories; radiofluorine; radioisotopes in bacteriology; radiophosphorus; radiosodium; radiostrontium; books; review articles; statistical and mathematical evaluations; and index of authors.

RADIATION EFFECTS

2027

Argonne National Lab.
FURTHER STUDIES ON FACTORS INFLUENCING RECOVERY FROM RADIATION INJURY (abstract), p.31-2 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. L. O. Jacobson, E. K. Marks, E. L. Simmons, M. J. Robson, and E. O. Gaston. [nd.] 2p. (ANL-4401(p.31-2))

The 28-day LD_{50} for young adult mice given total-body x radiation was about 600 r. Exposure to 1000 r resulted in 100% mortality within 14 days. With Pb protection of the spleen there was 100% survival following exposure to 600 r, and 50% following 1000 r. Histologic examination showed intense ectopic blood formation in the Pb-protected spleens, and recovery of the irradiated hematopoietic tissue was essentially complete by 8 days after exposure. The spleen or appendix of young adult rabbits was Pb-protected during exposure to 800 r of x radiation. Recovery of the hematopoietic tissues of the animals with Pb protection of the spleen or appendix occurred more rapidly than in unshielded controls. Ectopic blood formation was minimal in the Pb-protected spleen and absent in the appendix, while in mice and rats it was greatly intensified. There are several possible explanations for the protection afforded by Pb shielding. One possibility is that a nonspecific reduction in "radiation toxicity" may occur by virtue of the "filtering action" of the spleen. Another possibility, which seems most plausible at present, is that the Pb-protected lymphatic tissue humorally stimulates regeneration of irradiated hematopoietic tissue. Studies involving the role of colonization or seeding and studies of the effects of extracts of lymphatic tissue on recovery from radiation injury are in progress.

2028

Argonne National Lab.
THE EFFECT OF SPLEEN PROTECTION ON IRON DISTRIBUTION IN IRRADIATED RATS (abstract), p.33-4 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. R. L. Huff, W. F. Bethard, J. F. Garcia, B. M. Roberts, L. O. Jacobson, and J. H. Lawrence. [nd.] 2p. (ANL-4401(p.33-4))

Eighty female Curtis-Dunning rats were divided into 4 groups treated as follows: (I) maintained as normal controls, (II) surgical mobilization of the spleen, but no radiation, (III) single total-body exposure to x radiation, as well as a sham operation in which the spleens were mobilized but not protected, and (IV) irradiated with the mobilized spleen in a lead chamber. Each of the x-irradiated animals received 500 r. Three days thereafter, and at comparable times for controls, each rat received intravenously approximately 10,000 cpm of Fe^{59}. Bone marrow of groups I and II contained 60% of injected Fe^{59} within 3 hr after injection. Similar curves for groups III and IV yielded maximum uptakes of 11 and 16%, respectively. Unexpectedly, the bone marrow in group IV animals showed significantly greater function than that in group III. Uptake of Fe^{59} in liver was greatest in group III (56%). Groups I, II, and IV gave values of 15, 15, and 43% in the order given. The uptake of Fe^{59} in spleen was nearly equal (1%) for groups I, II, and III. In the irradiated, spleen-protected animals, however, 7% of the injected tracer was found in the spleen.

2029

Argonne National Lab.
PROGRESS REPORT; CHRONIC EXTERNAL IRRADIATION, p.35-7 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. E. Lorenz, L. O. Jacobson, A. B. Eschenbrenner, D. Uphoff, H. Sutton, and R. Schweisthal. [nd.] 3p. (ANL-4401(p.35-7))

In an attempt to establish the 30-day LD_{50} for hybrid guinea pigs, a group was x-irradiated with a single total-body dosage of 360 r. Mortality (32%) was the same as that following 260 r given to a group of animals of the same age, stock, and weight. Although 200 r has been reported as the 30-day LD_{50} for these animals, the experimental data make this figure questionable. Another experiment is under way in which 400 r is used as the exposure level. A study is being made of long-term survival, blood changes, and carcinogenesis in animals exposed to total-body x radiation but with Pb protection of the spleen. Male and female C_3Hb mice were exposed to 900 r total-body x radiation while their spleens were exteriorized and shielded with Pb protectors. Of 78 female and 83 male mice, 4 females and 3 males died within 9 days after exposure. None died in the following 19 days. At 1 week after exposure there was leucopenia and a slight anemia, but at 2 weeks the blood picture returned to normal.

2030

Argonne National Lab.
SUMMARY OF FINISHED EXPERIMENTS; PART I. SURVIVAL AND BLOOD PICTURE OF HYBRID GUINEA PIGS EXPOSED TO LONG-CONTINUED TOTAL-BODY γ RADIATION, p.38-52 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. E. Lorenz, L. O. Jacobson, and H. Sutton. [nd.] 15p. (ANL-4401(p.38-52))

Groups of hybrid guinea pigs were chronically exposed to γ radiation at 8.8, 4.4, 2.2, 1.1, or 0.11 r, 8 hr/day, 7 days/week, beginning in February 1943. The last survivor died in May 1949. In the animals exposed to 2.2, 4.4, and 8.8 r there was a pronounced increase in mortality. All the animals in the 8.8 r group died of pancytopenia, while also caused most of the deaths at the other two levels. There were no deaths from pancytopenia in the 1.1 r group. In guinea pigs it appears that death from radiation-induced pancytopenia is a function of dose rate rather than total dose, and there is no linear relationship between mean survival time and mean lethal total dose.

2031

Argonne National Lab.
SUMMARY OF FINISHED EXPERIMENTS; PART II. RECOVERY FROM ANEMIA INDUCED IN GUINEA PIGS BY A LIMITED EXPOSURE TO CHRONIC TOTAL-BODY γ RADIATION, p.53-71 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. E. Lorenz, L. O. Jacobson, Harriet Sutton, and R. Schweisthal. [nd.] 19p. (ANL-4401(p.53-71))

Inbred guinea pigs were given limited chronic exposures to γ radiation. The smallest accumulated dosage was 757 r (86 days) and the largest, 1804 r (205 days). The animals were removed from the field when the red blood counts reached about 2.5 millions. Three different responses followed removal from exposure: (1) some animals died within a few weeks; (2) some showed partial recovery lasting about 25 weeks at which time there was a lethal recurrent anemia; and (3) in some there was complete recovery. Blood data are given for each of these groupings. Pancytopenia was the cause of death in guinea pigs exposed to 8.8 r (8 hours per day, 7 days per week). There was such an abrupt onset of anemia that a hemolytic factor was suggested.

2032

Argonne National Lab.
PROGRESS REPORT; NOTES ON THE EVALUATION OF MATERIALS THAT MIGHT BE EXPECTED TO ALTER RADIOSENSITIVITY, p.72-4 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. D. E. Smith, H. M. Patt, and E. B. Tyree. [nd.] 3p. (ANL-4401(p.72-4))

Thirty-day survival, time to 50% mortality, and average survival time of rats subjected to a single total-body exposure of 1000 r were taken as criteria of the capacity of materials to alter sensitivity to x radiation. Of materials so tested, BAL and cysteine + KCN administered prior to irradiation significantly decreased radiosensitivity; while thiamine-HCl, L-taurine, and tyrosine were without effect. Moreover, cysteine + KCN reduced radiosensitivity to the same degree as the same dose of cysteine alone, indicating that cysteine owes its protective ability to factors other than its reducing powers.

2033

Argonne National Lab.
PROGRESS REPORT; THE EFFECT OF X RAYS ON THE OXIDIZABLE SULPHYDRYL GROUPS OF RATS RECEIVING CYSTEINE, p.75-7 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. H. M. Patt, D. E. Smith, M. Blackford, and R. L. Straube. [nd.] 3p. (ANL-4401 (p.75-7))

The oxidizable sulfhydryl content of tissues obtained from irradiated (800 r, total-body) and nonirradiated rats receiving cysteine has been prepared. Cysteine (950 mg/kg intravenous) increased the sulfhydryl content of serum, kidney, thymus, small intestine, and liver. Similar increases were noted in cysteine-pretreated x-irradiated rats. X radiation had little effect on the oxidizable sulfhydryls of the control-irradiated animals. The studies suggest that cysteine apparently does not protect against x radiation because it acts as a substrate for oxidation by the free radicals that are presumably formed during exposure.

2034

Argonne National Lab.
PROGRESS OF THE LONG-TERM POLONIUM-MOUSE EXPERIMENT, p.78-95 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. Miriam Finkel, Gertrude Hirsch, Donald Gardiner, and Ruth McNunis. [nd.] 8p. (ANL-4401(p.78-95))

An analysis has been made of a portion of the data that are being collected on the long-term toxicity of intravenously administered polonium chloride. The experiment involves 720 CF-1 female mice (including controls). At 280 days the unquestionable deleterious effects of 0.027 to 0.008 μc/g

and possible adverse effects of 0.004 μc/g on survival, body weight, intestinal infection, spleen weight, and white blood-cell count were evident. Changes in the x-ray appearance of the long bones appeared in animals that received as little as 0.0009 μc/g, and osteogenic sarcomas occurred in two animals that were given only 0.00046 μc/g.

2035

Argonne National Lab.
OXIDASE INCREASE IN MELANOPLUS DIFFERENTIALIS EGGS CAUSED BY X IRRADIATION, p.120 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. T. N. Tahmisian and D. M. Adamson. [nd.] 1p. (ANL-4401 (p.120))

When diapause eggs of Melanoplus differentialis grasshoppers are x-irradiated (200 kv, 15 ma) with dosages ranging from 25,000 to 200,000 r, the hydroquinone oxidase activity in the eggs is decreased immediately after the exposure. The enzyme activity increases with time so that the highest activity is obtained approximately 8 days after exposure. Oxidase activity after irradiation varies in the following sequence: 25,000 r > 50,000 r > 100,000 r > 200,000 r > control. The oxidase is inhibited by cyanide, carbon monoxide, and heat. Its activity is not affected by azide, phenylthiourea, nor diethyldithiocarbamate.

2036

Argonne National Lab.
PROGRESS REPORT; INFLUENCE OF DOSAGE RATE ON X-RAY EFFECTS IN YOUNG CHICKS AND RATS, p.125-9 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. S. Phyllis Stearner and Emily J. B. Christian. [nd.] 5p. (ANL-4401(p.125-9))

Mortality of 2- to 3-day chicks within 24 hr after x irradiation (1000 r at 43 r/min has been described earlier. Administration of vitamin P substances had no effect on survival or hemorrhagic tendencies. Histamine is probably not an important factor in the reactions leading to the early deaths, for the chick shows a relatively low sensitivity to histamine shock. Although the speed with which death follows irradiation suggests that some part of the effect might be mediated through the autonomic nervous system, prophylactic and therapeutic treatment with atropine and physostigmine was without effect. Adrenaline was effective in increasing survival and in decreasing the severity and number of hemorrhages when its time of administration was close to that of x irradiation.

2037

Argonne National Lab.
PRELIMINARY REPORT; CYSTEINE PROTECTION OF TUMOR FRAGMENTS IN VITRO FROM IRRADIATION WITH LETHAL DOSAGES OF X RAYS, p.130-42 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. B. Vincent Hall. [nd.] 13p. (ANL-4401(p.130-42))

The experimental data are the first to demonstrate the marked protective effect of cysteine on the survival of tumor fragments irradiated in vitro with lethal dosages of x rays. Fragments varying from 10 to 15 mg were obtained from actively growing tumors and placed in either sterile 0.85% NaCl or sterile NaCl to which was added either *l*-cysteine hydrochloride, sucrose, or cysteine. After x irradiation the fragments were implanted in new hosts. Records were kept of the tumor growth following implantation, and the hosts were sacrificed at 22 days. At 4000 r only the cysteine-treated implants grew. At 3000 r 100% of the cysteine-treated tumors grew, whereas only 70% of the saline-treated tumors grew. The size of the tumor was inversely related to the amount of irradiation it received, and there was little difference in the ratios of volume increase between the control tumors and these x-irradiated with 1000, 2000, 3000, and 4000 r when pretreated with cysteine.

2038

Argonne National Lab.
PROGRESS REPORT; PHYTORADIOLOGY, p.144-51 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. S. A. Gordon, R. Stutz, and R. Weber. [nd.] 8p. (ANL-4401(p.144-51))

The first shoot of the oat seedling provides a tissue whereby one phase of the growth process, cellular expansion, can be separated from cellular division and differentiation. This phase of growth is apparently resistant to ionizing radiation, inhibition being manifest at rather high dose levels of x radiation. Within relatively narrow limits of dose, growth inhibition can be reversed following irradiation by addition of growth hormone (auxin) and partly reversed by sulfhydryl activants. Such reversals could be interpreted as indicating an inactivation of the foregoing essential components of the growth process by ionizing radiation. A small quantity of C^{14}-labeled growth hormone, indoleacetic acid, has been synthesized. Synthetic procedures employed are detailed, particularly in view of some erroneous aspects of the published method for the synthesis of this radioauxin. Initial biological experiments using radio-indoleacetate show the compound to be physiologically active and to have no deleterious effect on growth due to its emission.

2039

Argonne National Lab.
PRELIMINARY REPORT; HYDROGEN PEROXIDE FORMATION ON X IRRADIATION OF WATER WITH HARD AND SOFT X RAYS, p.164-6 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. E. S. Guzman Barron and Betty Gasvoda. [nd.] 3p. (ANL-4401(p.164-6))

Hydrogen peroxide formation on irradiation of distilled water by hard x rays (200 kv) and by soft x rays (50 kv, 40 ma) was measured by colorimetric determination at the end of irradiation. On irradiation with an intensity of 100,000 r there was formation of 4 μg/cc with hard x rays, and of 1.3 μg with soft x rays. There was a small increase on irradiation with soft x rays when the water was stirred with a magnetic stirrer.

2040

Argonne National Lab.
THE EFFECT OF X IRRADIATION ON CYTOCHROME C, p.167 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. E. S. Guzman Barron and Veronica Flood. [nd.] 1p. (ANL-4401(p.167))

This section of the report is in abstract form; it is reproduced here in its entirety.

Reduced cytochrome C was easily oxidized on irradiation with hard x rays (200 kv), the oxidation being proportional to the intensity of irradiation. The oxidation produced by 10,000 r was completely reversed on addition of a suitable reducing agent. The ionic yield was 0.55. It seems that this oxidation is produced only by the OH radicals given off on irradiation of water. H_2O_2 had no effect at all since the addition of catalase did not diminish the extent of oxidation. O_2H radicals (presumably formed on reduction of O_2 dissolved in water) seem also to have no effect because the extent of oxidation was not diminished on irradiation in the absence of dissolved O_2. On irradiation of ferricytochrome C in neutral, acid, and alkaline solutions with x-ray intensities of 50,000 and 100,000 r, it was found that cytochrome dissolved in acid solution was more susceptible to the destructive effect of ionizing radiations. On irradiation with 100,000 r in 0.005M HCl there was almost complete disappearance of the big Soret band of the porphyrin nucleus and of the band at 5300 A of ferricytochrome.

2041

Argonne National Lab.
PRELIMINARY REPORT; MAGNITUDE OF THE MATING RESPONSE AS A FUNCTION OF IRRADIANCE IN PARAMECIUM BURSARIA, p.168-9 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. C. F. Ehret. [nd.] 2p. (ANL-4401(p.168-9))

The diurnal rhythm of the mating response in Paramecium bursaria at 25°C persists for several days in darkness. Reactions occur only in phase with previously established light-dark cycles and at times corresponding to the light period. Early in these reaction periods light acts as a stimulus, later as an inhibitor of the magnitude of the reaction. Rhythmicity can be shifted out of phase by a single extension of a light period or reduction of a light period at a critical time. This shift of phase can also be accomplished by exposure of animals to lower temperatures (10 to 15°C) during the reaction.

2042

Argonne National Lab.
PRELIMINARY REPORT; EFFECT OF TEMPERATURE ON INACTIVATION OF BACTERIOPHAGE BY X RAYS, p.170 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT; NOVEMBER, DECEMBER, JANUARY, 1949-50. C. S. Bachofer, C. F. Ehret, and S. Mayer. [nd.] 1p. (ANL-4401(p.170))

Procedures have been established to determine the rate of inactivation by x rays of T-1 coliphage in broth and in chemically defined media, for liquid, dried, and lyophilized states. Equipment has been designed for irradiation in vacuo at different temperatures with simultaneous registering of temperature. The effect of temperature on x-ray inactivation has been investigated at various points from 77 to 310°K. It has been established that lower temperatures decrease the rate of x-ray inactivation.

2043

Argonne National Lab.
SOME LATE HISTOLOGICAL CHANGES IN MICE AFTER LOW DOSES OF PLUTONIUM AND RADIUM, p.174-84 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. William Bloom and Margaret A. Bloom. [nd.] 11p. (ANL-4401(p.174-84))

Mice were injected intravenously with plutonium nitrate (0.03 or 0.003 μc/g) or intraperitoneally with Ra (0.3 or 0.03 μc/g) and sacrificed at intervals of 2 months to a year thereafter. Results of histological examination of the spleen, lymph node, thymus, liver, testis, lung, skin, gastro-intestinal tract, and pancreas are given. The red pulp of the spleen was greatly increased after the higher doses of Pu and Ra and moderately increased after the low dose of Ra. The increase in hematopoiesis in the spleen was undoubtedly compensatory for the continued and progressive depression of the blood-cell-forming mechanism of the bone marrow of these mice. Even where hematopoiesis in the marrow persisted, it was predominantly myelocytopoietic rather than erythropoietic.

2044

Argonne National Lab.
CLOTTING TIME CHANGES AFTER TOTAL-BODY X IRRADIATION, p.19-23 of PROGRESS REPORT; ABNORMAL BLEEDING. J. G. Allen, L. J. Savage, P. V. Moulder, and D. M. Enerson. Mar. 1950. 5p. (ANL-4474(p.19-23))

This report is an analysis of the clotting times of 79 irradiated dogs studied consecutively from July 1, 1948, to February 1, 1950. The clotting time measurements were made by the same personnel, and the data obtained are illustrated. The platelet counts made daily on this same series of animals are also presented. It is indicated beyond doubt that the evidence pointing to increased clotting time after irradiation is not attributable to chance alone.

2045

Argonne National Lab.
SOME OBSERVATIONS ON THE RELATIONSHIP OF HEPARIN TO PROTAMINE SULFATE AND THE BLOOD PLATELETS, p.34-59 of PROGRESS REPORT; ABNORMAL BLEEDING. J. G. Allen, P. V. Moulder, M. H. Sanderson, and W. M. Egner. Mar. 1950. 26p. (ANL-4474(p.34-59))

In vivo and in vitro heparin sensitivity are greatly increased in thrombocytopenia and prothrombin deficiency. One of the potential functions of the platelet is its limited antiheparin action. It is not known whether this is a physiologic action in continuous operation. A series of experiments is presented that indicate that changes in heparin sensitivity of blood and the protamine titration, also performed on whole blood, are not identical. 20 references. (auth)

2046

Argonne National Lab.
PLASMA ANTITHROMBIN IN IRRADIATED AND HEPARINIZED DOGS; A PRELIMINARY STUDY, p.88-98 of PROGRESS REPORT; ABNORMAL BLEEDING. D. M. Enerson, B. J. Grossman, and J. G. Allen. Mar. 1950. 11p. (ANL-4474(p.88-98))

The blood of 4 normal dogs given intravenous injections of heparin (0.5 mg/kg of body weight) displayed a pronounced increase in the whole-blood clotting time with only a slight increase in antithrombin titer. Fifteen of 17 dogs given total-body x irradiation developed mild to moderate increases in the whole-blood clotting times with pronounced increases in the antithrombin titer. 11 references. (auth)

2047

Argonne National Lab.
PHYSICAL PHENOMENA IN BLOOD COAGULATION, p.99-111 of PROGRESS REPORT; ABNORMAL BLEEDING. N. J. Galluzzi, D. M. Enerson, D. J. Glotzer, P. V. Moulder, and J. G. Allen. Mar. 1950. 13p. (ANL-4474(p.99-111))

An increase in plasma surface tension has been observed following total-body x irradiation in the dog. This increase can be explained in part on the basis of changes in both the concentration and the state of particulate aggregation of plasma proteins. The in vivo changes are greatly out of proportion to the measurable in vitro changes of surface tension with variations in protein concentration. (auth)

2048

Argonne National Lab.
FURTHER STUDIES ON THE ISOLATION OF HEPARIN FROM BLOOD OF IRRADIATED DOGS, p.112-22 of PROGRESS REPORT; ABNORMAL BLEEDING. J. M. Sutherland and J. G. Allen. Mar. 1950. 11p. (ANL-4474 (p.112-22))

A method is presented for the extraction of heparin from blood by which crystals of the barium salt of heparin can be prepared and identified from blood to which heparin has been added in amounts of 10 mg % or larger. The amount of heparin necessary to cause prolonged clotting time in irradiated dogs is 4 to 28 μg %, or less than 5% of the least amount detectable by the method employed. By this procedure, no anticoagulant could be extracted from the blood of irradiated dogs. 17 references. (auth)

2049

Argonne National Lab.
IN VIVO CHANGES IN THE ULTRAVIOLET ABSORPTION SPECTRUM OF DOG PLASMA FOLLOWING EXPOSURE TO X IRRADIATION, p.123-27 of PROGRESS REPORT; ABNORMAL BLEEDING. K. A. Lathrop, R. F. Gilmore, and J. G. Allen. Mar. 1950. 5p. (ANL-4474(p.123-27))

A study was undertaken of the ultraviolet absorption spectrum of plasma of dogs following exposure to 450 r total-body x irradiation. Simultaneous plasma protein and albumin-globulin assays have been made on a large number of the animals studied. The ultraviolet absorption at 278 mμ closely parallels the protein level, irrespective of quantitative changes in the albumins and globulins.

2050

Argonne National Lab.
CORRELATED STUDIES ON THE IRRADIATED DOG, p.128-47 of PROGRESS REPORT; ABNORMAL BLEEDING. P. V. Moulder, K. A. Lathrop, B. J. Grossman, N. J. Galluzzi, M. H. Sanderson, E. M. Burnham, and J. G. Allen. Mar. 1950. 20p. (ANL-4474(p.128-47))

A number of blood and plasma abnormalities in the irradiated dog have been presented in previous sections. In an attempt to correlate these abnormalities, three dogs were given 450 r total-body x irradiation and the following studies were made: (1) complete hemocytology; (2) coagulation survey; (3) plasma proteins; (4) surface tension and viscosity measurements; (5) plasma ultraviolet light absorption; and (6) protein and proteose sulfhydryl polarographic curves. Data were collected from the three animals, and large quantities of blood had to be drawn each day. The results, however, correspond with the findings in other irradiated dogs in which the effect of exposure upon each of these analyses was made. One of the reasons why these studies were made was the hope that some of these functions might serve as an index of the severity of x-ray exposure. No group of changes could be demonstrated shortly after irradiation that could be used to indicate the lethality of the dose.

2051

Argonne National Lab.
SUMMARY OF IRRADIATION EFFECTS OF THE BLOOD COAGULATION MECHANISM, p.148-67 of PROGRESS REPORT; ABNORMAL BLEEDING. J. G. Allen, P. V. Moulder, D. M. Enerson, K. A. Lathrop, and M. H. Sanderson. Mar. 1950. 20p. (ANL-4474(p.148-67))

The hemostatic mechanism is more complicated than can currently be explained, and the damages produced by total-body x irradiation are so far-reaching that most, if not all, of the clotting mechanism may be directly or indirectly affected. In addition, there is evidence of widespread vascular damage about which little is known. However, certain features of the pathogenesis of this syndrome are established and limited therapeutic aid is available. A summary discussion on certain of the phenomena described in the previous parts is presented in this section. Some recent data are included to augment the discussion. The whole-blood clotting time, a clotting inhibitor, thrombocytopenia, and capillary injury are discussed. 15 references.

2052

ALTERATIONS IN THERMAL FRAGILITY OF RAT ERYTHROCYTES FOLLOWING TOTAL BODY X-IRRADIATION. Leontine Goldschmidt, Robert L. Rosenthal, Victor P. Bond, and Maurice C. Fishler. Am. J. Physiol. 164, 202-6(1951) Jan. 1.

A review of the literature has revealed indirect but not direct evidence that radiation affects the integrity of the circulating red cell. A method for the quantitative measurement of red-cell hemolysis produced by an elevated temperature has been presented. By this method, a definite increase in red-cell fragility was demonstrated in rats within 4 to 12 hr following their exposure to total-body

x irradiation at 500 and 600 r. A possible mechanism of these changes and their significance in radiation sickness are discussed. (auth)

2053

THE CHANGES IN CELL MORPHOLOGY AND HISTOCHEMISTRY OF THE TESTIS FOLLOWING IRRADIATION AND THEIR RELATION TO OTHER INDUCED TESTICULAR CHANGES. I. QUANTITATIVE RANDOM SAMPLING OF GERMINAL CELLS AT INTERVALS FOLLOWING DIRECT IRRADIATION. Lloyd C. Fogg and Russell F. Cowing. Cancer Research 11, 23-8(1951) Jan.

Testes of pure line C57 black adult mice, 18 to 25 g, were subjected to a single dose of x radiation at 300 r, both direct and total-body. The evaluation of radiation effects has been based on a quantitative random sampling of the germinal elements of the testis, quantitated with respect to frequency of cell population types plotted against time after radiation. Evidence is presented to show that a small percentage of all germinal elements persist after a dose of 300 r. The period of least frequency of spermatocytes is around 14 days; that of spermatids and sperm is 28 days. The data indicate that it takes 21 to 22 days for a gonium to develop into sperm. The slopes of the curves in terms of time and progressive loss of each of the germinal elements are roughly the same. This suggests that each of the germinal elements is affected to the same degree but at different intervals. The period of greatest biological variation is from 10 to 28 days for each of the four germinal elements. A single dose of 300 r does not cause the disappearance of Sertoli cells or hyperplasia of the interstitial cells, nor is connective tissue visibly affected in the 12-week interval included in this study. (auth)

2054

CYTOLOGICAL LOCALIZATION OF THE TRANSLOCATION POINT FOR THE BARLEY MUTANT ELECTOIDES 7. Arne Hagberg and Joe Hin Tjio. Hereditas 36, No. 4, 487-91(1950).

Among the viable morphological mutations caused by x radiation on barley the so-called erectoides mutations, which are mutations in internodal length, are more frequent than others. So far some 40 different cases of mutations of the erectoides type are known. Although gene maps based on linkage experiments have been constructed, no genes have been cytologically localized until now. The present paper describes the first cytological characterization of a barley mutant, that of erectoides 7. It has been concluded that erectoides 7 is strongly linked to a translocation point. By applying the oxiquinoline technique it was possible to localize this point to the long arm of chromosome I, between the secondary constriction and the chromosome end, or to the shortest arm of chromosome V.

2055

DO X-RAYS RESUSCITATE HEAT-KILLED SEEDS? Nils Nybom. Hereditas 36, No. 4, 516-17(1950).

A series of 50 barley seeds were exposed to 90°C for 30 min, then x irradiated immediately (20,000 r, 170 kv, 6 ma, 1 mm Al). Two weeks thereafter the seeds, together with heat-alone, x-ray-alone, and untreated control series, were placed in a germinating apparatus. The percentage of germinating seeds increased from 46% for the heat-alone control series to 80% for the series exposed to both heat and x radiation. Both the heat-treated and the x-rayed seeds showed full and positive peroxydase reactions in these experiments.

2056

THE EFFECTS OF ELECTRONS, POSITRONS AND α-PARTICLES IN PLANT DEVELOPMENT. A. Gustafsson, L. Ehrenberg, and M. Brunnberg. Hereditas 36, No. 4, 419-44(1950).

The present investigation was planned to elucidate the mutagenic effects of electron-emitting P^{32} and S^{35}, positron- and γ-emitting Na^{22}, and α-particle-emitting Rn^{222} and Po^{210}. The material consisted of medium-sized seeds of the Bonus strain of two-row barley. In some instances the so-called Allium test was applied. The effects which are specially discussed in this paper concern seedling lethality, plant growth, number of induced chromosomal aberrations, and, in addition, the uptake of the radioactive isotopes, as well as their transport and distribution within the plant at distinct intervals after their application. 29 figures.

2057

THE EFFECT OF RADIOACTIVE PHOSPHORUS UPON THE DEVELOPMENT OF THE EMBRYONIC TOOTH BUD AND SUPPORTING STRUCTURES. M. S. Burstone. Am. J. Path. 27, 21-32(1951) Jan.-Feb.

Administration of P^{32} to pregnant mice results in disturbances of osteogenesis and odontogenesis in the offspring. The dosages required to produce these changes are less than are required to produce similar changes by injecting immature mice. With dosages of 10 to 17 μc/g of body weight of mother, there is cessation of histodifferentiation of ameloblasts and odontoblasts. In some regions the ameloblasts appear as squamous epithelium, and are without function. The odontoblasts appear as spindle cells with cytoplasmic processes. These cells are associated with osteodentin formation. The odontoblast is more radiosensitive than the ameloblast. Development of the third molar tooth is completely inhibited. Alterations in the condyle are indicative of an abnormal premature aging process. Aplasia of marrow, premature subcartilage linkage, and decreased osteoblastic activity are characteristic changes. 12 figures. (auth)

2058

THE EFFECT OF RADIOACTIVE PHOSPHORUS UPON THE DEVELOPMENT OF THE TEETH AND MANDIBULAR JOINT OF THE MOUSE. M. S. Burstone. J. Am. Dental Assoc. 41, 1-18(1950) July.

Administration of radioactive phosphorus, P^{32}, to young mice resulted in disturbances of osteogenesis or odontogenesis, or both. With dosages of 15 to 60 μc/g, the ameloblasts toward the root portion of the crown appeared as low cuboidal or squamous cells. There was a cessation of histo differentiation of new ameloblasts. With the same dosages the structure of the odontoblast was altered. The older odontoblasts toward the coronal portion of the tooth

appeared unchanged, while the newly differentiated odontoblasts at the root portion of the tooth appeared as spindle cells with cytoplasmic processes. These cells were associated with osteodentin formation. There was a cessation of morphodifferentiation of the root structure of the animals which survived longer than 2 weeks. The odontoblast was more radiosensitive than the ameloblast. The most marked changes in histodifferentiation and morphodifferentiation were observed in the offspring of pregnant mice which received P^{32}. Dosages of 10 to 60 μc/g of body weight produced a marked marrow aplasia of the alveolar bone. With 15 to 60 μc/g of body weight there was a marked decrease in osteoblastic activity with the formation of immature fibrillar bone. Ten to 60 μc/g of body weight resulted in an inhibition of ossification and calcification of the mandibular condyle. Marrow aplasia, subcartilage linkage, and decreased osteoblastic activity with poor trabecular formation were present. The areas of the cartilage cap exhibited a decreasing radiosensitivity in the following order: zone of erosion, hypertrophic zone. The interarticular disk was radioresistant. The effect of β radiation upon the teeth and jaws is similar to that of x radiation. (auth)

2059

EFFECT OF RADIOPHOSPHORUS ON RATS WITH COBALT-INDUCED POLYCYTHEMIA. W. F. Bethard, E. Skirmont, and L. O. Jacobson. Paper presented at the Central Society for Clinical Research 23d Annual Meetings, Chicago, Nov. 3-4, 1950.

An abstract of this paper appeared in J. Lab. Clin. Med. 36, 800(1950) Nov. and is reproduced here in its entirety.

Seventy-eight female Sprague-Dawley rats averaging 250 g in weight, were divided into the following categories: Group I, those given Co only. Group II, those given only Co for 12 weeks, and then both Co and P^{32}. Group III, normal control animals. Group IV, those given P^{32} only. Group V, those given Co and P^{32}, started simultaneously. Co was administered as $CoCl_2 \cdot 6H_2O$. Each of the treated animals received 1.25 mg/kg of Co ion subcutaneously five times per week. Severe polycythemia invariably appeared by the end of 12 weeks. Radiophosphorus was used in the dose of 1.5 μc/g intraperitoneally every 3 weeks. Hematocrit, hemoglobin, heterophil, and lymphocyte determinations were performed every 3 weeks. Except for initial polycythemia in animals of Group II, they and those of Group IV responded similarly to radiation. Hematocrit and hemoglobin values began to fall after a total P^{32} dose of 4.5 μc/g had been given (22d week). The drop continued gradually until the 28th week, after which each came to rest at considerably lower level. Rats in Group V, however, developed polycythemia despite simultaneous administration of P^{32} and tolerated a total P^{32} dose of 9.0 μc/g before hematocrit and hemoglobin values began to fall. The drop was then more rapid than, but quantitatively similar to, those of Groups II and IV. It would appear that no significant difference in sensitivity to radiophosphorus exists between normal rats and rats with an established Co polycythemia. In contrast, the initial bone marrow hyperactivity following Co administration apparently affords some protection to the destructive effects of P^{32} when the two are begun simultaneously. It has been postulated that one mechanism of both radiation injury and Co polycythemia is inactivation of SH-bearing enzymes or substrates. If this were true, one would expect no protective action, rather the destructive effects might be additive. It would seem therefore that such mechanism is not the only possibility for either radiation injury or Co polycythemia.

2060

THE EFFECT OF ROENTGEN, γ, AND β RAYS ON THE EPIDERMAL CELL. EXPERIMENTS ON THE "NIPPLE TEST" ASSOCIATED WITH THE DUSTIN REACTION. W. Jadassohn, E. Bujard, R. Paillard, P. Wenger, and P. Gaudin. Acta Radiol. 34, 469-87(1950) Dec. (In French)

The combined action of irradiation therapy and treatment by estrogenic hormones on the nipple of the male guinea pig has been studied and controlled by Dustin's colchicinic reaction. Roentgen, γ, and β rays administered in sufficiently large doses inhibit mitosis of the epidermal cells of the nipple. This action is also maintained if estrogenic hormones are administered after irradiation. This effect of irradiation is more evident when the irradiation is combined with the application of an estrogen, as the control nipple presents more mitoses. A dose of 200 r has no appreciable effect; on the other hand, 400 r or still larger doses are effective. A single dose of 2400 r given under varying physical conditions and consequently for varying lengths of time (from 4 min 26 sec to 153 min 27 sec) is effective regardless of the type of rays used. The effect of 2400 r decreases if this total dose is applied in fractional doses of 200 r per day over 12 days. Irradiation has the same effect on the nipple showing acanthosis produced by the administration of estrogenic hormones prior to irradiation. Estrogenic hormones cause a thickening of the epidermis of the nipple, i.e., acanthosis, through mitosis and a mild degree of simple hypertrophy of the cells. A few mitotic figures are also seen if estrogenic hormones are administered after irradiation. It is evident that irradiation therapy does not totally destroy the capacity of the epidermal cells to divide. However, the number of mitotic figures is too small to explain the thickening of the epidermis after irradiation. The action of estrogenic hormones administered after irradiation produces a simple hypertrophy involving similarly the nuclei and the cytoplasm, and a certain degree of imbibition of the epidermis, the combination of which we call pseudoacanthosis. (auth)

2061

THE EFFECT OF X-RADIATION ON EXPERIMENTALLY PRODUCED CUTANEOUS SENSITIVITY. Sheldon G. Cohen, Lloyd D. Mayer, and Leo H. Criep. J. Investigative Dermatol. 16, 91-6(1951) Feb.

Thirty-seven albino guinea pigs were sensitized to *p*-phenylenediamine with the production of cutaneous hypersensitivity. Nineteen of the sensitized animals received 175 r of total-body x radiation. An attenuation of the degree of skin sensitivity appeared in a majority of the irradiated animals as compared with the nonirradiated controls when tested by the external application of *p*-phenylenediamine ointment to the skin. No differences was observed between the irradiated and nonirradiated groups when the intradermal method of testing for delayed type of skin sensitivity was employed. (auth)

2062

EFFECT OF X-RAYS ON IMMUNITY: A REVIEW. William H. Taliaferro and Lucy Graves Taliaferro. J. Immunol. 66, 181-212(1951) Feb. (See also NSA 3-197)

Small amounts of x rays, often administered locally, sometimes enhance antibody formation and the immunity of experimental laboratory animals to nonliving antigens and certain infections. This conclusion has also been reached with respect to a wide range of infections in man, but may not in all cases be justified because of inadequate controls. The mechanism involved in an enhanced immunity by x rays has been variously explained, but has not been adequately clarified. Large amounts of x rays have occasionally been reported to produce beneficial effects in the host, but further work on this aspect of the subject is needed. A well-established instance occurs in trichinosis. In this infection, treatment of the host with large doses of x rays directly inhibits early embryonic development of the worms. X rays approaching lethal amounts when administered to the entire body often decrease host immunity to specific infections and lower antibody formation. The mechanism whereby immunity is reduced needs further experimental analysis but is, in large part, reasonably explained by the pronounced radiosensitivity of lymphocytes (including various "blasts"). There is no evidence that x rays enhance the virulence of the parasites or affect their antigenicity. The differential effectiveness of the same dose of x rays in different infections and at different periods of the same infection may be partly correlated with the degree of immunity present at the time of radiation. 201 references. (auth)

2063

EFFECT OF X-RAYS ON NUCLEIC ACID AND PROTEIN SYNTHESIS. Richard Abrams. Arch. Biochem. 30, 90-9 (1951) Jan.

The effect of x radiation on the synthesis of nucleic acid purines has been investigated in rat intestine and in rabbit intestine and bone marrow. The rates of synthesis of desoxyribonucleic acid and ribonucleic acid were markedly reduced by x rays, while the synthesis of protein was relatively unaffected. There was no effect on the purine composition of the nucleic acids, but the relative concentration of ribonucleic acid was lowered significantly. The implications of these findings are discussed. (auth)

2064

FAILURE OF A FLAVONOID TO REDUCE RADIATION MORTALITY IN MICE. E. P. Cronkite, W. H. Chapman, and F. W. Chambers. Proc. Soc. Exptl. Biol. Med. 76, 282-4(1951) Feb.

A flavonoid (vitamin "P") compound isolated from citrus fruit was given subcutaneously twice daily to white Swiss inbred male mice, beginning 5 days before irradiation with 750, 850, 950, or 1050 r of 2000-kvp x rays, and continuing until the mice died or for 15 days after irradiation. Total daily dose was 0.13 mg/g of mouse. At the doses of radiation used the compound gave no protection. There was no evidence of any toxicity of the compound in mice at the dose used. It is concluded that a flavonoid compound is of no value in the treatment of radiation injury in the LD_{80} to LD_{100} range in mice.

2065

Naval Radiological Defense Lab.
THE INABILITY OF CYSTEINE TO PROTECT ERYTHROPOIETIC BONE MARROW AGAINST IRRADIATION INJURY AT A DOSE LEVEL OF 800 r. Thomas G. Hennessy and Fleming B. Folsom. Nov. 6, 1950. 9p. (AD-266(B))

Studies of the radioiron, Fe^{59}, red-blood-cell uptake in rats that had received cysteine previous to x irradiation were conducted. Control groups of irradiated and nonirradiated rats were also studied. It is concluded that cysteine shows no protective effect against depression of erythropoiesis at the 800-r level of x irradiation. (auth)

2066

Naval Radiological Defense Lab.
THE INABILITY OF GLUTATHIONE TO PROTECT ERYTHROPOIETIC BONE MARROW AGAINST IRRADIATION INJURY AT A DOSE LEVEL OF 300 r. Thomas G. Hennessy, Fleming B. Folsom, and John K. Glover. Nov. 6, 1950. 11p. (AD-267(B))

The uptake of radioiron, Fe^{59}, in the red blood cells of rats that had received subcutaneous injections of glutathione 0.5 hr previous to total-body x irradiation was studied along with that of control groups of irradiated and nonirradiated rats. It is concluded that glutathione shows no significant protective effect against depression of erythropoiesis at the 300-r level of total-body x irradiation. (auth)

2067

INDUCED PREGNANCY IN A MAMMALIAN HOST FOLLOWING SEVERE TOTAL BODY X-IRRADIATION. Paul E. Rekers. J. Lab. Clin. Med. 37, 331-41(1951) Mar.

Pregnancy was readily and naturally induced in dogs after large doses of total-body irradiation of LD_{60} or more. A full-term, viable pup was whelped from the dam receiving the largest dose of irradiation. A second dam aborted following a pulmonary infection. The third dam delivered three living pups, one of which was underdeveloped and succumbed. This dam and the two offspring have remained well. During the gestation period of 50 days or more there were normal gross alimentations, constant weights, and varying degrees of depression of the peripheral blood elements without bacterial invasion of the blood stream or intravascular hemolysis. After whelping or aborting there was a rapid decline in the physical condition of two of the three dams, subsequent death, and the findings of sepsis and degeneration including the hemopoietic tissues. From the data presented it does not appear that fetal tissue provided an active hemopoietic center for the irradiated dam. The question, however, of the protective action of embryonic tissue for maintaining resistance to infections and of benefit from fetal endocrine or enzyme systems is raised. 29 references. (auth)

2068

IRRADIATION INJURIES OF THE HAND. Michael L. Mason. Quart. Bull. Northwestern Univ. Med. School 25, No. 1, 51-9(1951) Spring.

The real cause of irradiation dermatitis is reported to lie in the effect of the rays upon the cells of the skin and subcutaneous tissues, upon the amount and quality of the irradiation delivered, and upon the susceptibility of the tissues and of the individual. A consideration which is of especial interest to the medical and dental profession is the fact that irradiation doses are cumulative and even very small daily exposures continued over a sufficient period of time will give rise to irritative lesions. Cases of irradiation dermatitis may be classified into five large groups, depending roughly on the rate and manner in which treatment has been given. These are discussed at length. In Group 1 are placed those individuals whose exposure to irradiation has consisted of many small or minute doses extending over a period of months or years. Group 2 is made up of patients who in some way or other have received a massive overexposure. Occasionally this exposure is accidental, as when the voltage on a line suddenly changes or is altered without the knowledge of the operator. Group 3 is made up of patients whose injury was occasioned by the use of irradiation designed to destroy some lesion of the skin or some of the cutaneous appendages (hair). In some instances malignant tumors, usually carcinoma, have been irradiated and presumably destroyed. In Group 4 have been placed the patients who have an irradiation dermatitis following treatment of some deep-lying condition. Very few examples of this type of reaction are seen on the hand since the indications seldom obtain. Group 5 concerns irradiation for infection. A number of years ago, before the introduction of the sulfonamides and the antibiotics, the x ray was used quite extensively in the treatment of infection. There was no real agreement as to the value of this treatment.

2069

OCULAR CHANGES PRODUCED BY TOTAL BODY IRRADIATION. Helenor Campbell Wilder and Russell M. Maynard. Am. J. Path. 27, 1-19(1951) Jan.-Feb.

Pathological changes in the eyes of 21 goats and 31 pigs receiving varying amounts of total-body ionizing radiations at Operations Crossroads, Bikini, have been compared with those in the eyes of 24 pigs exposed to 200 to 600 r of total-body roentgen radiation and of 4 fetuses from x-irradiated sows. Nine control goats and 15 control pigs were examined. The pathological changes in the bomb-exposed and x-irradiated animals were similar. For the most part, they were regarded as results of bone marrow depression and secondary systemic changes, rather than as direct effects of the rays. The hemorrhages were attributed to thrombocytopenia and to a heparin-like substance. Serous exudates were the result of increased vascular permeability, possibly secondary to anemia. Septic choroiditis and bacteria in the vessels were manifestations of the septicemia. Vacuoles were present in the lenses of many of the irradiated animals but were found also in the controls and therefore were not regarded as a specific manifestation of irradiation. Massive cataract in irradiated animals may have been due to direct radiation, although secondary nutritional effects associated with anemia and severe hemorrhages could not be ruled out. Immediate changes in the lens specific for irradiation were not apparent in the young or mature animal. Although the secondary effects of ionizing and roentgen radiation were similar in the eyes of both pigs and goats, there were no ocular changes which could be attributed unequivocally to direct irradiation. 11 figures.

2070

REGENERATION OF HEMATOPOIETIC ORGANS IN HEAVILY-IRRADIATED MICE PROTECTED BY KCN INJECTION. H. Betz and L. Fruhling. Compt. rend. soc. biol. 144, 1013-15(1950) July. (In French)

Adult C57 mice were irradiated with 700 r of 250-kv x rays immediately following an intraperitoneal injection of 0.05 mg of KCN. The 75% of animals surviving the irradiation were sacrificed after periods of 24 hr to 10 months. The regeneration of blood, bone marrow, spleen, thymus, lymphatic nodes, and liver is described in some detail. The delay in regeneration is the same as that observed at much lower radiation doses. In addition, the rate of regeneration exceeds that of normal animals. The present results confirm the view that mortality in irradiated animals is not due to cell destruction but to a more general disturbance involved in the "alarm reaction."

2071

A STUDY OF THE HEMORRHAGIC STATE IN DOGS AFTER A LETHAL DOSE OF TWO MILLION VOLT X-RAYS. E. P. Cronkite, B. Halpern, D. P. Jackson, and George V. LeRoy. Paper presented at the Central Society for Clinical Research 23d Annual Meeting, Chicago, Nov. 3-4, 1950.

An abstract of this paper appeared in J. Lab. Clin. Med. 36, 814(1950) Nov. and is reproduced here in its entirety.

Ten dogs were given a single dose of 600 r (300 r to each side) of 2,000,000-volt x rays. The following studies of blood clotting were performed serially: platelet count; clotting time of whole blood; clot retraction and lysis; one-stage prothrombin time; protamine-heparin titration of whole blood (Allen); test for circulating anticoagulants (Conley); heparin-protamine titration of oxalated plasma (LeRoy); and determination of fibrin N. All animals died between the 8th and 13th day after irradiation. There was visible evidence of spontaneous hemorrhage in every one for at least 48 hr before death. The occurrence of purpura bore a very close relation to the onset of elevation of temperature. Diffuse, extensive hemorrhage was found in every animal at autopsy. During the performance of the autopsies the blood clotted firmly. The mean clotting time of whole blood was significantly prolonged after the 6th day. The mean platelet count was less than 50,000 after the 8th day. There was no evidence that heparinemia was responsible for either the prolonged clotting time or the hemorrhagic state. In every dog whose clotting time was longer than 1 hr it was possible, at some time, to reduce it to less than 1 hr when protamine sulfate was added in the course of the protamine-heparin titration (Allen). In every animal the one-stage prothrombin time was within normal limits. Conley's test for circulating anticoagulants was positive in two dogs, and was questionably positive in four dogs at

some time after irradiation. However, in every animal Conley's test was negative at some time after irradiation when the clotting time of whole blood was longer than 1 hr. Fibrinogen was present in increased amounts in all dogs from the 7th day after irradiation. It appears that the hemorrhagic state that occurs in animals that have received lethal doses of x rays is not identical with any of the hemorrhagic diseases encountered in clinical practice. In addition to the thrombocytopenia, there is reason to suspect the occurrence of a circulating anticoagulant, the nature of which is not known.

2072

X-RAY INDUCED DOMINANT LETHALS IN DROSPHILA MELANOGASTER. G. Bonnier and K. G. Luning. Hereditas 36, No. 4, 445-56(1950).

Wild-type males of D. melanogaster were irradiated with about 2900 r and mated to y w sn females of a maximum age of 3 days. Corresponding controls (without irradiation) were also made. The hatchability of the eggs was studied after varying the age of the males at fertilization and after varying the length of time between irradiation and fertilization. It was found that both these factors were active in decreasing the hatching rate. The decline ranged from about 50% to about 30% or still lower. In the controls a normal hatching rate of between 80 and 90% was found without any effect from aging the males. Unmated or mated state of the males prior to the present mating had no effect on the hatchability. Apart from the foregoing causes of variation in the hatching rates of the eggs other nonrandom causes of unknown origin were also active. A discussion is submitted of possible forces at work with a tentative explanation. (auth)

RADIATION HAZARDS AND PROTECTION

2073

Los Alamos Scientific Lab.
LABORATORY STUDIES ON THE REMOVAL OF PLUTONIUM FROM LAUNDRY WASTES. John F. Newell, C. W. Christenson, H. L. Krieger, D. W. Moeller, E. R. Mathews, and C. C. Ruchhoft. [nd.] 16p. (AECU-1008; LADC-800)

An abstract of this report was assigned the number AECU-837 and was reproduced in its entirety in Nuclear Science Abstracts as NSA 4-4141.

2074

AUTOMATIC CONTROL REDUCES ATOMIC-ENERGY PLANT HAZARDS. Instruments 24, 200-2(1951) Feb.

Brief descriptions of automatic temperature, humidity, static-pressure and air-velocity controls used to minimize the hazards in atomic energy plants are presented. There are currently three broad areas of application of automatic control apparatus in these plants. Plants where radioactive materials are handled almost always are equipped with complete air-conditioning systems, and automatic temperature-control apparatus is used to solve the same problems encountered in any first-class industrial building. A second type of control application is specifically related to the presence of radioactive materials. In most plants dealing with radioactive materials, this involves the precise control of the movement of air within each building to keep contamination at a minimum. Much of the space within a building handling radioactive materials may consist of hot-zone laboratories in which special fume hoods are installed for the treatment of materials. The use of these fume hoods, which are connected to exhaust ducts to provide a positive air movement to remove radioactive fumes and other toxic gases, has resulted in the development of the third application of automatic control apparatus in atomic energy plants. This is the pressure-difference method of velocity control, which has been adopted at Argonne and Hanford. It depends for its operation on the fact that the velocity of air moving between two points is proportional to the difference in pressure between these points.

2075

BACKGROUND RADIATION MONITORING FOR CONTROL OF AN AIR-COOLED PILE. Frederick P. Cowan. Paper presented at the 1951 Institute of Radio Engineers National Convention, New York, Mar. 19-22.

An abstract of this paper appeared in Proc. I.R.E. 39, 312 (1951) Mar. and is reproduced here in its entirety.

Since small concentrations of radioactive argon are discharged from an air-cooled pile, radiation monitoring stations are desirable in the vicinity. Operation of the pile is based on the records of such stations and on meteorological predictions of atmospheric dilution. Detection devices utilized in the Brookhaven stations include several G-M counters, an ionization chamber with associated electrometer, and a continuous dust monitor. Data is recorded photographically and on charts. Normal background amounts to about ¼ mr/day on the ion chamber, 30 c/m on a thin glass-walled G-M tube 10 in. long, and 15 c/m on a similar tube with 1½-in. lead shield. Peaks due to rainfall and the effect of snow cover are clearly apparent. Sizable peaks in natural dust activity are caused by temperature inversions. The apparatus has been in service for 2 yr and has a data collection efficiency of 85 to 90%. Only small increases in the average background beyond the BNL site boundary result from operation of the pile.

2076

Naval School of Aviation Medicine and Research, Pensacola
EVALUATION OF PRESENT DAY KNOWLEDGE OF COSMIC RADIATION AT EXTREME ALTITUDE IN TERMS OF THE HAZARD TO HEALTH. Hermann J. Schaefer. Apr. 30, 1950. 32p. (NP-1735)

The fact that the intensity of cosmic radiation increases rapidly from its small value at sea level as altitude increases raises the question of a possible hazard to health in flight at extreme altitudes. The biological dosage rate increases from its sea level value of 0.1 mr/day to a maximum of 15 mr/day at 70,000-ft altitude in northern latitudes. Beyond this altitude the dosage rate decreases owing to the decrease in the number of collision processes of the primaries with the air molecules. The ionization from cosmic radiation is produced largely by particles of a

higher specific ionization than x rays and β particles. The milliroentgen-equivalent-man values therefore will be markedly higher than the equivalent-physical values. Present knowledge does not yet permit a reliable numerical value for this conversion factor. Beyond 70,000 ft, a new component has been discovered, the heavy nuclei rays. Their specific ionization is much higher than any other hitherto observed value. The mechanism of absorption in matter is of the same type as that of α particles but magnified by a factor of 1000. Their range in living tissue reaches values of 10 cm in comparison with 50 μ for α particles. An estimation of their possible biological action indicates that they might represent a serious hazard to health.

2077

MANUAL OF BASIC TRAINING. Vol. II. Atomic Warfare. Pamphlet No. 6. Civil Defence Home Office. London, His Majesty's Stationery Office, 1950. 61p.

The manual is based on the known effects of the type of bombs used against Hiroshima and Nagasaki. The aim is to point out practical steps which will reduce the casualty-producing power of the atomic bomb. Chapters on the following topics are included: features of an atomic explosion, heat flash, radioactivity, blast, and elementary atomic physics.

2078

NATURAL REMOVAL OF POLLUTION FROM THE ATMOSPHERE. A. R. Meetham. Quart. J. Roy. Meteorol. Soc. 76, 359-71(1950) Oct.

Observations of atmospheric pollution throughout Britain are considered in relation to the amounts of pollution emitted through the combustion of coal. The estimated weight of ash emitted into the air and the estimate, from deposit gauges, of the ash deposited, are considered likely to agree fairly well at a figure of more than 10^6 tons/yr. It is indicated that about 1.5×10^6 tons of smoke and about 1.1×10^6 tons of SO_2 are blown to sea each year and that 0.8×10^6 tons of smoke and 3.9×10^6 tons of SO_2 are deposited in Britain, irrespective of quantities measured in deposit gauges. The average life of a smoke particle before deposition on land is probably of the order of 1-2 days; that of a molecule of SO_2 is estimated to be less than 12 hr. Of the chlorides collected in deposit gauges more than half, as a rule, come from the sea, and less than half from the utilization of coal; but the ratio will vary with the position of the deposit gauge relative to the sea and to industries. (auth)

2079

OBSERVATIONS ON THE REMOVAL OF RADIOACTIVE MATERIALS FROM WASTE SOLUTIONS. Conrad P. Straub. Sewage and Ind. Wastes 23, 188-93(1951) Feb.

Many of the methods available for use in the treatment of industrial wastes may be utilized in the treatment of radioactive wastes. However, just as in sewage and industrial waste treatment, separation of the wastes into their liquid and solid fractions and discharge of the innocuous fraction does not solve the problem. The residue remains for disposal. All that can be accomplished is to concentrate the radioactive fraction into a smaller volume to permit disposal either as a sludge or a slurry. Where incineration is possible, provided precautions are taken to prevent contamination by volatile gases or fly ash, further concentration or reduction in volume may be obtained. The reduced volume of solid material then may be placed in suitable containers and buried in controlled areas or stored for decay or future recovery.

2080

PUBLIC HEALTH ASPECTS OF ATOMIC ENERGY. A. Wolman. Am. J. Pub. Health 40, 1502-7(1950) Dec.

An abstract of this paper appeared in Pub. Health Engr. Abstracts 31, 8(1951) Mar. and is reproduced here in its entirety.

The experience of the last 8 to 10 yr makes quite clear that a new industry has been developed in this country which in its implications and in its expenditures is already larger perhaps than any other industry in the United States. Its operations and its product have many significant effects upon workers and the general public. By most criteria hitherto used in the public health field, atomic energy would appear to be a matter of great import to public health practitioners. Few if any of the official agencies have developed staff or administrative procedures in relation to the ever-expanding nuclear fission industry. That such a gap in health department responsibility should be permitted to continue is one of the mysteries of the last decade. For the welfare and health of the nation the gas should be closed. A minimum requirement for state and local activity in this field would appear to be the development of at least a few key professionals in each department, familiar with and skilled in the atomic energy field. These individuals should gradually evolve both peacetime and wartime rules of action which would gradually encompass responsibility for the control of the hazards potentially inherent in nuclear fission operations and in the use of their products. Even with such modest beginning, official health agencies would recapture a responsibility which has always been theirs.

2081

TOLERANCE DOSE PROBLEMS IN RADIOLOGICAL WORK. P. Bjerre Hansen and C. B. Madsen. Acta Radiol. 34, 519-28(1950) Dec.

A series of hematological examinations and measurements of the exposure to ionizing radiation of the personnel of the Departments of Radium Therapy, Roentgen Therapy, and Diagnostic Roentgenology, Aarhus, is reported. It is shown that the tolerance dose, which has so far been set at 100 mr/day, is fairly close to the limit of the sensitivity of the hematopoietic system. Since, as reported by other investigators, a risk of other harmful effects of exposure to radiation of this order of magnitude must be taken into consideration, it is proposed to reduce the tolerance dose to 100 mr/week. (auth)

RADIATION SICKNESS

2082

CITRUS VITAMIN P AS PROTECTION AGAINST ATOMIC RADIATION. Boris Sokoloff and Walter H. Eddy. Citrus Ind., 5-8, 16(1951) Feb. (See also NSA 4-5358)

References to two types of atomic attack are made, i.e., ground explosion and air explosion. Effects of each are considered briefly. Radiation illness following a radiation dose of 1100-1200 r is described. Radiation effects on the wall of the capillaries are described as particularly harmful. It is suggested that vitamin P from citrus fruits (P standing for capillary permeability factor) might be of service in atomic medical defense. A brief history of the discovery of vitamin P is given. References to rutin as having similar properties are made. Experiments with vitamin P on rats following irradiation showed a substantial increase in their power of recovery. Uses to prevent skin erythema in x-ray therapy are discussed.

2083

THE DIAGNOSIS AND TREATMENT OF RADIATION SICKNESS IN ATOMIC WARFARE. Eugene P. Cronkite. Western J. Surg. Obstet. Gynecol. 59, 55-61(1951) Feb.

The diagnosis of superficial and total-body radiation injuries which may be seen after an atomic bomb explosion has been considered. This diagnosis can be based on simple clinical observations which will permit the segregation of the exposed population into treatment groups, allowing the use of available medical personnel, supplies, and equipment in the best interests of the maximum number of casualties. Treatment is based on established therapeutic principles. It is believed that modern medicine with adequate supplies of fresh blood, stored plasma, antibiotics, sterile parenteral fluids, and sterile dressings can do much toward alleviating suffering and improving survival after an atomic bomb attack. This attitude should greatly improve civilian morale and the will to resist. It is emphasized that adequate care depends on an effective organization of medical care on a state, regional, and national basis. Standardized treatment is necessary and should be based on a desire to give the best possible care regardless of the effort involved. Adequate safe stockpiling of drugs and medical supplies and equipment is essential. 16 references. (auth)

2084

NURSING CARE FOLLOWING EXPOSURE TO IONIZING RADIATION. Ruth Freeman. Am. J. Nursing 51, 86-8 (1951) Feb.

Effects of radiation sickness characteristically present, such as blood changes, shock reaction, gastrointestinal symptoms, rise in temperature, etc., are described. Phases of radiation sickness are considered. Lists of points on nursing aid for appraisal of radiation injury, maintaining the injured individual's resistance, preventing infection, restoring body fluids, and providing emotional guidance are assembled.

2085

THE ROLE OF INFECTION IN RADIATION INJURY. C. Phillip Miller and Carolyn W. Hammond. Trans. Assoc. Am. Physicians 63, 155-60(1950) May 2-3.

Male white mice from an inbred stock were subjected to total-body irradiation by exposing them to a single dose of x rays delivered at 20 kv, 15 ma, at a distance of 27 in. using ½-mm Cu and 3-mm Bakelite filters. The LD_{50} at 30 days was approximately 400 r. On each postirradiation day groups of mice were killed, autopsied under aseptic precautions, and heart's blood and spleen were cultured aerobically and anaerobically. Cultures of heart blood and spleen of mice subjected to a single dose of x radiation showed a high incidence of bacteremia during the second week, the period of greatest mortality. The bacteremia was caused by microorganisms normally present in the lower bowel of stock mice. In a majority of animals, the infection was severe enough to be regarded as an overwhelming sepsis. The administration of appropriate antibiotics caused a significant reduction in mortality among the mice irradiated with 450 r. These results led to the conclusion that infection plays an important role in death from x radiation. Antimicrobial therapy is not a cure for radiation injury, but it can be highly effective in preventing death from infection after exposure to moderate doses of irradiation. 10 references.

2086

RUTIN AND OTHER FLAVONOIDS AS POTENTIATORS OF TERMINAL VASCULAR RESPONSES TO EPINEPHRINE AN AND AS ANTAGONISTS OF VASODEPRESSOR MATERIALS. J. M. Crismon, Ronald R. Berez, James D. Madden, and Frederick A. Fuhrman. Am. J. Physiol. 164, 391-9(1951) Feb. 1.

The terminal vascular bed of the rat mesoappendix was used to determine the effect of rutin and other flavonoids on the response of the smooth muscle components to topically applied epinephrine. Alteration in the threshold concentration of epinephrine necessary to produce constriction of metarterioles and precapillary sphincters was used as a measure of activity. Intravenously injected rutin (in propylene glycol) in doses of 2.5 to 50 mg/kg reduced the epinephrine threshold to about 40% of the initial level. A dose of 1 mg/kg was somewhat less effective and 0.5 mg/kg was without effect. Rutin given by stomach tube was effective in reducing the epinephrine threshold within 75 min and remained effective for at least 5½ hr. Sodium rutin acid succinate, methylated hesperidin chalcone, and the sodium salt of hesperidin chalcone also reduced the threshold of the smooth muscle components of the vascular bed to topically applied epinephrine. Rutin antagonized the vasodepressor effect of edema fluid from frostbitten limbs as well as the effect of hepatic vasodepressor material (ferritin). 31 references. (auth)

2087

TREATMENT OF HIGH INTENSITY BURNS. Everett Idris Evans. Arch. Surg. 62, 335-49(1951) Mar.

In modern warfare when certain high explosives burst within a confined space, as on naval vessels, and especially with the explosion of atomic bombs, temperatures of exceedingly high order are achieved, so that a new type of thermal injury, the "flash burn," is made possible. An atomic bomb explosion releases enormous quantities of energy as blast, radiation (γ and neutron) and ordinary heat. Competent observers estimate that at Hiroshima and Nagasaki probably 50% of the casualties were due to thermal injury (burns); so the problem of treatment of high-intensity burns has assumed major importance in atomic warfare. It is indicated that the "flash burn" from an atomic explosion would respond to the same treatment and have the same clinical course as a burn of the same intensity from other sources. The discussion covers the emergency phase of burn management, prevention and treatment of burn shock, the emergency dressing, liver damage in severe burns, and subsequent care of the burn patient. Burn problems as a result of atomic warfare for which the author states there are at present no answers listed.

RADIOTHERAPY

2088

A 1000-CURIE COBALT-60 IRRADIATOR. L. G. Grimmett. Texas Repts. Biol. Med. 8, No. 4, 480-90(1950) Winter.

Plans for a 1000-c Co^{60} irradiator are described. In a discussion of Co^{60} as a substitute for costly Ra in therapeutic uses, the decay scheme of Co^{60}, radiation spectra of Co^{60}, comparison with Ra(B + C) and a 2-Mev x-ray tube, isodose curves in water of a 10-g Ra unit for γ-ray therapy, comparison of x- and γ-ray depth doses in water, depth-dose curves for x rays (200 kv to 4 Mev), comparison of true energy absorptions in bone, muscle, fat, etc., are referred to in an analysis and justification of the need for such an irradiator.

2089

RADIUM COMES BACK. Mississippi Valley Med. J. 73, 60-1(1951) Mar. (Editorial)

It is stated that the γ rays from Ra were the first and still are the best possible source of radiation for the destruction of malignant tissue. Packing of 50 g of Ra to be shipped from Belgium to the Roosevelt Hospital, New York City, is reported. Solving of the problem of excessive skin damage in deep-seated therapy by the use of a 50-g converging-beam Ra therapy unit is described. In this arrangement the Ra is packed in 2-g containers and the 25 units are arranged in a circle so placed that the beam from each unit is directed at an angle. All the 25 beams come to a focus at the apex of a cone. Appropriate safety features are described.

2090

TREATMENT OF VAQUEZ'S DISEASE (POLYCYTHEMIA VERA) WITH RADIOPHOSPHORUS. Jacques Closon. Presse méd. 58, 1192-5(1950) Oct. 25. (In French)

The essential symptomatology of polycythemia vera and particularly of cryptogenetic polycythemia vera is presented. The antimitotic therapeutic agents (x rays, nitrogen mustard, and especially P^{32}) are discussed. P^{32} is the treatment of choice; the therapeutic dose is between 60 and 100 μc/kg of body weight when administered intravenously. If given orally the dose should be increased by 25%. Three case histories are presented in detail. 5 figures.

TOXICOLOGY STUDIES

2091

Argonne National Lab.
THE RETENTION AND DISTRIBUTION OF U^{233} IN MICE. W. E. Kisieleski, W. G. Faraghan, and W. P. Norris. Nov. 1950. (Decl. Feb. 2, 1951) 2p. (AECD-3057)

A study of the metabolism and organ distribution of U^{233} injected intravenously in mice is reported. The major portion of the injected material was rapidly excreted; about 50% was retained at 3 to 4 days and only about 20% at 6 days. The bone was the principal site of deposition.

2092

Radiation Lab., Univ. of California
BERYLLIUM POISONING; REPORT OF A CASE TREATED WITH ADRENOCORTICOTROPIC HORMONE. R. Lowry Dobson and John C. Weaver. Oct. 27, 1950. 35p. (UCRL-996)

The case is presented of a young man with progressive pulmonary fibrosis or granulomatosis of 5-yr duration presumably caused by the inhalation of beryllium oxide. His illness was complicated by the development of pulmonary tuberculosis. Treatment with ACTH caused remarkable improvement at a time when he appeared to be terminal. Following this he failed to improve further, and his condition has remained stationary for 6 months on continued ACTH therapy. 13 figures. (auth)

2093

ABSORPTION AND DISTRIBUTION OF THORIUM NITRATE IN THE RAT. Paul R. Salerno and Paul A. Mattis. Paper presented at the American Society for Pharmacology and Experimental Therapeutics Fall Meeting, Boston, Nov. 13-15, 1950.

An abstract of this paper has appeared in J. Pharmacol. Expti. Therap. 101, 31-2(1951) Jan. and is reproduced here in its entirety.

$Th(NO_3)_4$ was administered to adult male rats by several routes, and the tissue distribution was studied by means of UX_1 (Th^{234}) as a radioactive indicator. Studies on rats given 30 mg/kg by stomach tube revealed that maximal absorption had occurred within 4 days and that more than 90% of the absorbed dose was deposited in the skeleton. After 32 days, 100% of the retained Th, which represented 0.06% of the administered dose, was found in the skeleton. When larger doses of Th (700 to 800 mg/kg) were administered by oral intubation, no absorption could be measured, which indicates that less than 0.001% is absorbed at this dosage level. Absorption following subcutaneous administration was found to be progressive in that 0.03 and 0.07% of the injected dose was found in the skeleton at 16 and 30 days, respectively. Following the intraperitoneal

injection of 60 mg/kg of Th, 1% of the dose was deposited in the skeleton after 30 days. $Th(NO_3)_4$ administered intravascularly by intracardiac injection was retained to the extent of 95, 89, and 83% at 3, 8, and 14 days, respectively. Tissue distribution in terms of per cent of injected dose was 16% to the skeleton, 55% to the liver, and 5% to the spleen after 14 days. Two hours after intracardiac injection, 50% of the Th is removed from the blood, and 7.6% is found in the skeleton. Less than 1% is found in the blood after 18 hr. Most of the Th which is excreted is found in the feces and apparently is transported from the liver via the bile.

2094

ANTIDOTAL ACTION OF POLYPHOSPHATES IN URANIUM POISONING. H. C. Hodge, E. A. Maynard, and W. L. Downs. Paper presented at the American Society for Pharmacology and Experimental Therapeutics Fall Meeting, Boston, Nov. 13-15, 1950. (See also NSA 4-5843)

An abstract of this paper appeared in J. Pharmacol. Exptl. Therap. 101, 17-18(1951) Jan. and is reproduced here in its entirety.

In previous studies it has been established that uranium nitrate hexahydrate fed at 2% of the diet or given intraperitoneally in a single dose of 2.5 mg/kg to adult albino rats produces approximately 50% mortality during the ensuing 21 days. Previous attempts to provide an antidote for acute U poisoning led to the suggestion of bicarbonate because this ion furnishes a diffusible complex with the uranyl ion. Following the recent demonstrations of the complex established between uranyl ion and bone surface (Neuman), between the uranyl ion and the surfaces of yeast cells (in both cases probably with phosphate groups), and between the uranyl ion and various polyphosphates (Rothstein), tests were carried out to see whether polyphosphates could be used in the treatment of acute experimental U poisoning. The excretion of Ca salts of polyphosphates in urine (Gosselin) prompted the trial of these compounds both in feeding studies and after intraperitoneal injections of U. The polyphosphate was administered sometimes as a single dose and sometimes in multiple injections intraperitoneally. There was considerable evidence that a marked reduction in mortality can be achieved.

2095

AN ATTEMPT OF EXCRETING INJECTED THOROTRAST IN RABBITS BY 2,3-DIMERCAPTOPROPANOL (BAL). Björn E. W. Nordenström-Blomqvist. Acta Radiol. 34, 533-45(1950) Dec.

An experimental attempt was performed to excrete intravenously injected thorotrast in rabbits by 2,3-dimercaptopropanol (BAL). No excretion of Th was found in urine. The radioactivity in urine depends upon disintegration products of Th, of which ThX (Ra^{224}) and $MsTh_1$ (Ra^{228}) were found. After BAL treatment there was no sign of increased radioactivity in urine or significant decrease of the radioactivity in liver, spleen, kidney, or yellow bone marrow. The radioactivity of the spleen was four times as high as that of the liver, measured on the γ intensity per gram. The radioactivity of the kidney was low in comparison with that of the liver and spleen. (auth)

2096

DECREASE OF ADRENAL ASCORBIC ACID AND CHOLESTEROL IN RAT AND GUINEA PIG, FOLLOWING LARGE DOSES OF GLUTATHIONE. M. M. Carey, E. P. Vollmer, R. L. Zwemer, and D. L. Spence. Am. J. Physiol. 164, 770-3(1951) Mar. 1.

Glutathione, in dosage that protects mice against irradiation and potassium poisoning, produces toxic reactions in rats and guinea pigs and lowers their adrenal cholesterol and ascorbic acid. The latter changes indicate stimulation of the adrenal cortex, probably by way of the pituitary. Since there is some evidence that adrenal cortical hormones, like glutathione, confer protection against alloxan, potassium, and irradiation it appears possible that the protection attributed to glutathione is achieved at least in part through adrenocortical stimulation and release of hormone. Such a sequence would also explain why glutathione potentiates the diabetogenic effect of cortisone in rats. On the other hand, it is possible that the effect of glutathione on the adrenal is a toxic response merely incidental to the protective effect and not responsible for it. The available evidence is not adequate to indicate whether the protective properties of the two classes of substance, thiols and adrenocortical steroids, are independent and parallel or linked through a common homeostatic mechanism.

2097

EXCRETION BY THE RAT OF INTRAVENOUSLY INJECTED $Ga^{72}Cl_3$ AND Ga^{72} CITRATE. E. R. King, H. D. Bruner, J. D. Perkinson, and Joe Gray. Paper presented at the American Society for Pharmacology and Experimental Therapeutics Fall Meeting, Boston, Nov. 13-15, 1950.

An abstract of this paper has appeared in J. Pharmacol. Exptl. Therap. 101, 21(1951) Jan. and is reproduced here in its entirety.

As a part of a general study of the biological significance of Ga, the excretion by the rat of a freely ionizing compound such as $GaCl_3$ was compared with that of a slowly ionizing compound, Ga citrate. $GaCl_3$ or Ga citrate tagged with Ga^{72} was administered intravenously in tracer doses to groups of 24 and 20 animals, respectively. Urine and feces were collected separately at 12-, 24-, 48-, 72-, and 96-hr intervals. The results expressed in terms of per cent of total dose excreted show the principal organ of excretion to be the kidney. About 35% of the total dose of $GaCl_3$ was excreted during the first 12 hr, with 48, 52, 53, and 54% cumulatively excreted at 24, 48, 72, and 96 hr. Of the citrate salt, 22% was excreted during the first 12 hr while 52, 62, 72, and 72% cumulatively was excreted during those 24-hr periods. The total fecal excretion at the end of 96 hr was 7.8% for the $GaCl_3$ and 3.3% for the Ga citrate.

2098

GLUTATHIONE PROTECTION AGAINST POTASSIUM IN MICE. R. L. Zwemer, E. P. Vollmer, and M. M. Carey. Am. J. Physiol. 164, 766-9(1951) Mar. 1.

Potassium tolerance as a measure of body resistance is remarkably uniform in a wide variety of vertebrate species. The potassium tolerance of mice, both male and female, is greatly increased by injection of glutathione. Protection is

effective immediately and is demonstrable for 6 hr. Potassium tolerance curves for various amounts of glutathione show that protection was increased at all KCl levels used, in relation to the amount of glutathione given. Glutathione was selected as the substance to be thus tested because it is normally present in the adrenal cortex and will diminish the lethal effects of radiation.

2099

THE TISSUE DISTRIBUTION AND EXCRETION OF RADIOACTIVE HAFNIUM[181] MANDELATE IN THE RAT. C. Frederick Kittle, E. R. King, and Marshall Brucer. Paper presented at the American Society for Pharmacology and Experimental Therapeutics Fall Meeting, Boston, Nov. 13-15, 1950.

An abstract of this paper has appeared in J. Pharmacol. Exptl. Therap. 101, 21(1951) Jan. and is reproduced here in its entirety.

The tissue distribution and excretion of Hf^{181} was determined in 17 rats sacrificed in groups of 3 at intervals of 1, 2, 3, 4, 8, and 16 days after intravenous administration of the mandelate salt. After pseudoashing the tissues with HNO_3, radioactivity was measured utilizing a thin-walled, end-window, G-M counter. Seven per cent of the Hf was excreted in 16 days (5% urinary, 2% fecal) with 5% being eliminated within 4 days. The liver, skeletal, muscular, and integumentary systems, respectively, showed greatest retention calculated on an organ basis, while the spleen, liver, and bone were highest when expressed on an activity per gram basis. Slight but significant amounts were found in the adrenal glands and other parenchymatous organs. Results were correlated with tissue autoradiographs. The 10-day LD_{50} for stable Hf mandelate given in a single intravenous dose was of the order of 100 mg/kg, while with Hf gluconate administered in successive daily intraperitoneal doses, the LD_{50} was 2 to 3 g/kg.

TRACER APPLICATIONS

2100

Harvard Medical School
STUDIES ON THE BIOSYNTHESIS OF OVALBUMIN. Christian B. Anfinsen and Daniel Steinberg. [nd.] 11p. (AECU-992)

Crystalline radioactive ovalbumin has been prepared by in vitro incubation of hen's oviduct minces with $C^{14}O_2$. By using a bacterial proteolytic enzyme it has been possible to split off less than 2% of this labeled protein molecule in the form of small peptides for comparison with the remainder. It has been shown that under the conditions of these experiments, aspartic acid isolated from the peptide fraction has a much higher specific acitivity than the average specific activity of aspartic acid residues in the remaining protein fraction. It is suggested that these results support a theory of ovalbumin synthesis by way of peptide intermediates. (auth)

2101

Argonne National Lab.
PROGRESS REPORT; A STUDY OF THE THYROID-PITUITARY AXIS OF THE WHITE LEGHORN FOWL USING I^{131}, p.143 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. David M. Morris. [nd.] 1p. (ANL-4401 (p.143))

A study of the uptake and distribution of I^{131} in thyroid, plasma, and the pituitary of White Leghorn cockerels and capons at several age levels has been initiated. Preliminary data indicate that the concentration of this isotope in the organic and inorganic fractions of the thyroid is the same in both cockerels and capons. It is suggested that the accumulation of radioiodine in the pituitary of cockerels is greater than that in capons. Problems proposed for future study include the investigation of the uptake of I^{131} in pituitaries of thyroidectomized birds and an attempt to learn the nature of the pituitary iodine by the use of paper partition chromatography.

2102

BIOSYNTHESIS OF RADIOACTIVE MEDICINALLY IMPORTANT DRUGS WITH SPECIAL REFERENCE TO DIGITOXIN. E. M. K. Geiling, F. E. Kelsey, A. Ganz, E. J. Walaszek, G. T. Okita, S. Fishman, and L. B. Smith. Trans. Assoc. Am. Physicians 63, 191-5(1950) May 2-3.

Incorporation of C^{14} into medicinal plants from which digitoxin, morphine, atropine, veratrine, convallerotoxin, and nicotine are derived, based on greenhouse growth under fluorescent lights and in atmosphere containing $C^{14}O_2$, is described. A diagram of the enclosed plant arrangement and tabular data on the excretion of digitoxin and its metabolites from bile fistula dogs are given. Concentration of digitoxin in the tissues, and excretion of digitoxin and its metabolites from the guinea pig and cat are included.

2103

BLOOD VOLUME DETERMINATION: COMPARISON OF T-1824 AND P^{32} LABELED RED CELL METHODS. Louis R. Wasserman, Tse-Fei Yoh, and Ira A. Rashkoff. J. Lab. Clin. Med. 37, 342-52(1951) Mar.

A method for blood-volume determination using P^{32}-tagged red cells is described. Blood volume determined by the T-1824 method is higher than that obtained with labeled red cells. The relationship between body and venous hematocrit is discussed. The 15% difference between the body and venous packed-cell volumes is due to a plasma occlusion factor as well as to an inherent variation between venous blood and the blood in the entire circulation. 19 references. (auth)

2104

DISAPPEARANCE OF ISOTOPICALLY LABELED GOLD COLLOIDS FROM THE CIRCULATION OF THE DOG. C. W. Sheppard, Gilbert Jordan, and P. F. Hahn. Am. J. Physiol. 164, 345-50(1951) Feb. 1.

Immediately following injection of radioactively tagged colloidal gold particles in the dog the circulatory level drops exponentially with time, the half-value time being about 1½ min. A very low residual level is reached in about 10 to 20 min showing occasional fluctuations. A high concentration of activity is then found in the buffy coat fraction, and if blood is withdrawn and transfused into a second ani-

mal the initial rapid rate of decline is not observed. The possibility is explored that the rate of the initial disappearance might be quantitatively related to the total blood flow rate to the liver. (auth)

2105

DISTRIBUTION OF GALLIUM IN MAN; AUTOPSY EVIDENCE. Marshall Brucer. Paper presented at the American Society for Pharmacology and Experimental Therapeutics Fall Meeting, Boston, Nov. 13-15, 1950.

An abstract of this paper appeared in J. Pharmacol. Exptl. Therap. 101, 4-5(1951) Jan. and is reproduced here in its entirety.

One 14-yr-old patient with osteogenic sarcoma (primary removed) metastatic to the lungs was given 50 mc of Ga^{72} in 375 mg of stable Ga as a gallium citrate complex. It was administered intravenously in divided doses of 5 to 15 mc at 4-day intervals. At autopsy the distribution in 38 types of tissue was found relatively uniform. Only in kidney, liver, and bone was there increased retention of Ga^{72}. All metastatic nodules sampled showed greater activity per gram than did any normal organ. One 68-yr-old patient with multiple myeloma received intravenously 178 mc of Ga^{72} in 681 mg of stable Ga in the citrate complex. The doses of 4-day intervals ranged from 20 to 50 mc each. On autopsy, the marrow, cortical bone, liver, kidney, and spleen showed the greatest retention of Ga^{72}. There was no normal bone, but the greater relative distribution in areas of increasing myeloma activity was shown by autoradiograms.

2106

DYNAMIC ASPECTS OF SODIUM METABOLISM IN EXPERIMENTAL ADRENAL INSUFFICIENCY USING RADIOACTIVE SODIUM. Thomas N. Stern, Vinton V. Cole, Anne C. Bass, and R. R. Overman. Am. J. Physiol. 164, 437-49 (1951) Feb.

Loss of extracellular Na and chloride to some body tissue in acute adrenal insufficiency has been confirmed. Analyses of liver, spleen, heart, muscle, brain, skin, and gut did not reveal increased Na, but an elevated chloride concentration was found in muscle, heart, and brain. A new method for the analysis of Na in bone has been presented; bone, as represented by the midfemur, was also shown not to have a detectable increase in Na concentration during adrenal insufficiency. Na^{24} has been employed to study Na turnover in acute adrenal insufficiency. Erythrocyte Na turnover was measured in 11 normal dogs and in 5 bilaterally adrenalectomized dogs in insufficiency. Although the trend was toward a more rapid turnover rate in dogs in insufficiency, no statistically significant difference appeared in this small series. The relative activities of liver, muscle, heart, gut, and skin for dogs in adrenal insufficiency were not different from normal at the time intervals measured; however, if such differences exist they might have been masked because the tissues were sampled at times when they were near Na^{24} equilibrium with the extracellular fluid. The radioactivity data indicate that Na metabolism in bone is drastically altered in adrenal insufficiency, since both the height and shape of the relative specific activity curve for bone in the insufficient dog are obviously different from normal. 29 references. (auth)

2107

IRON METABOLISM IN THE COBALT-POLYCYTHEMIC RAT. Nathaniel I. Berlin, Rex L. Huff, and Thomas G. Hennessy. J. Biol. Chem. 188, 445-50(1951) Feb.

In both normal and polycythemic rats, 1% of the Fe in the red blood cells (labeled with Fe^{55} and Fe^{59}) is turned over per day, which is equivalent to a mean life span of the red blood cell of 100 days. Co does not accelerate the processes of maturation of the red blood cells which involve the incorporation of Fe. (auth)

2108

SCINTILLATION-COUNTER BRAIN NEEDLE. Douglas Kohl. Nucleonics 8, 79-83(1951) Mar.

A probe which permits greater localization of labeled tumors than does G-M probes has been developed. With crystals as small as 6 mm^3, its response is independent of physical shock and temperature. (auth)

2109

USE OF CALCIUM-45 IN BIOLOGICAL STUDIES. C. L. Comar, Sam L. Hansard, S. L. Hood, M. P. Plumlee, and B. F. Barrentine. Nucleonics 8, 19-31(1951) Mar.

Integrated procedures are presented for the use of radiocalcium in animal and plant studies, including a detailed discussion of self-absorption corrections. A simplified centrifugation method is described for collecting precipitates for radioassay and gravimetric analysis, and considerations in regard to concurrent use of Ca^{45} and P^{32} are discussed. 21 references. (auth)

2110

THE USE OF RADIOACTIVE AND STABLE ISOTOPES IN HEMATOLOGY. L. R. Wasserman, I. A. Rashkoff, and T. F. Yoh. J. Mt. Sinai Hosp., N. Y. 17, 1037-47(1951) Mar.-Apr.

A general review of the use of isotopes in hematology is presented. References to the following examples have been made. The life span of the human erythrocyte was obtained by employing red cells labeled with N^{15}. The present concept of iron metabolism includes important contributions made by a host of investigators utilizing the radioactive isotopes Fe^{55} and Fe^{59}. The use of radioactive zinc, Zn^{65}, has increased knowledge concerning the importance of this trace element in the body economy. When Zn^{65} is injected into a human subject, it first becomes bound to a fraction of the serum protein. Later it is found within the red and white cells of the peripheral blood. In erythrocytes, the Zn content parallels the degree of carbonic anhydrase activity and probably catalyzes the production of carbonic acid within the red cell. When radioactive phosphorus, P^{32}, is injected into a human, it is distributed throughout the body wherever P turnover takes place. Maximal uptake occurs where there is increased mitotic activity, as in regenerating liver, bone marrow, and neoplastic tissue; eventually it is localized in the bones. Radioactive sodium, Na^{24}, has been used in some cases of chronic leukemia. Radioactive gold, Au^{198}, when injected intravenously in the colloidal state, concentrates in the reticuloendothelial system of the

liver, spleen, and lymphoid tissue. For this reason it has been used in such pathologic states as lymphosarcoma, reticuloendotheliosis, leukemia, and Hodgkin's disease, 34 references.

2111

USE OF RADIOACTIVE TRACER MATERIAL IN THE DIFFERENTIAL DIAGNOSIS OF EXPERIMENTAL JAUNDICE. Walter W. Carroll, Arthur S. Biddle, and John A. D. Cooper. Quart. Bull. Northwestern Univ. Med. School 25, No. 1, 13-18(1951) Spring.

Following the intravenous administration of I^{131}-labeled tetraiodophenolphthalein predictable blood and urinary dye levels can be obtained in the normal dog. Characteristic blood curves representing these dye levels are seen to vary extensively with dye dosage. A 0.5-g dose of tetraiodophenolphthalein is found to be a practical one to uncover the variations anticipated between normal and jaundiced dogs. When the dog's common bile duct is completely obstructed by ligature, alterations in the blood and urinary dye-level curves are found which are characteristic. When the liver suffers acute cellular necrosis such as is produced by chloroform intoxication, the resultant jaundice can be differentiated from that due to common-duct obstruction by predictable alterations in these same dye levels. Detailed analysis of renal excretion data during the first 12 hr of this test serves further to differentiate between the normal and jaundiced dogs of the categories described. Quantitative fecal analysis serves to differentiate the common-duct-obstructed dog from the normal and from one with acute hepatocellular necrosis. (auth)

CHEMISTRY

2112

Ames Lab.
THE STANNOUS CHLORIDE COMPLEXES. CONTRIBUTION 117. Frederick R. Duke and Welby G. Courtney. [nd.] 10p. (AECU-1103)

A general method is outlined for evaluating equilibrium constants of complex ions when the parent positive ion participates in a reversible electrode reaction. The equilibrium constants of stannous and chloride ions at an ionic strength of 2.03 were determined. (auth)

2113

Oak Ridge National Lab.
NIOBIUM PHOSPHATE; A NEW COMPOUND. Richard B. Hahn. Jan. 8, 1951. 7p. (ORNL-840)

A known amount of niobium pentoxide in the form of potassium niobate was treated with an excess of H_3PO_4 and HNO_3, and the mixture was heated in a water bath until precipitation was complete (30 to 60 min). The precipitate was quantitatively transferred to a filter and washed with a cold 1:1 acetone-water mixture until the excess H_3PO_4 was eliminated. The washed precipitate was ignited at 1000°C and weighed. X-ray-diffraction data are presented which show that the precipitate is neither Nb_2O_5 nor HPO_3. The composition of the precipitate was found to be 65.2 ± 0.2% Nb_2O_5 (calculated, for $Nb_2O_5 \cdot P_2O_5$, 65.19%) and 34.8 ± 0.2 % P_2O_5 (calculated 34.81%). The solution obtained from the fusion of the compound with NaOH gave a positive test for the orthophosphate ion. Hence, it is concluded that $NbOPO_4$, niobium oxy orthophosphate, is the most probable formula for the compound.

2114

Technical Information Div., ORE, AEC
RADIUM; A BIBLIOGRAPHY OF UNCLASSIFIED LITERATURE. Simone B. Schwind and Fred E. Croxton. July 1950. 82p. (TID-363)

This bibliography, which is arranged chronologically, consists of 745 references covering the period 1898 to 1950. Indexes to authors, subjects, patent numbers, and report numbers are included. Subject coverage does not include the properties of radium emanation and radiation. (auth)

2115

THE CHLORIDE ETHOXIDES OF ZIRCONIUM. D. C. Bradley, F. M. Abd-el Halim, and W. Wardlaw. J. Chem. Soc., 3450-4(1950) Dec.

Reaction of $ZrCl_4$ with ethanol yielded the compounds $ZrCl_3(OEt)\cdot EtOH$ (I), and $ZrCl_2(OEt)_2$ (II). Thus the order of reactivity with ethanol is $SiCl_4 > TiCl_4 > ZrCl_4 > ThCl_4$. By reactions involving (I), (II), or $Zr(OEt)_4$ with acetyl chloride the following new compounds of zirconium have been prepared: $ZrCl_4, CH_3\cdot CO_2Et$; $ZrCl_3(OEt)\cdot CH_3\cdot CO_2Et$; $ZrCl_2(OEt)_2\cdot EtOH$; $ZrCl_2(OEt)_2\cdot CH_3\cdot CO_2Et$; and $ZrCl(OEt)_3$. The stability of the compounds formed by the coordination of a molecule of ethyl alcohol or ethyl acetate with $ZrCl_3(OEt)$, $ZrCl_2(OEt)_2$, or $ZrCl(OEt)_3$ decreased as chlorine was replaced by ethoxide. (auth)

2116

DETERMINATION OF THE THIRD DISSOCIATION CONSTANT OF VANADIC ACID. P. Souchay and R. Schaal. Bull. soc. chim. France, 824-7(1950) Sept.-Oct. (In French)

The constant of the equilibrium ratio $(VO_4^{-3})(H^+)/(HVO_4^{--})$ has been determined by the method of cryoscopic titration at the transition point of Na_2SO_4 to be 6.5×10^{-14}. The conclusions previously drawn (Souchay and Carpèni, Bull. soc. chim. France 13, 160(1946)) attributing the two forms HVO_4^{--} and $V_2O_7^{-4}$ in equilibrium to the pyrovanadate ions are confirmed.

2117

Massachusetts Inst. of Tech.
EXPLOSIVE CHARACTERISTICS OF HYDROGEN PEROXIDE VAPOR. C. N. Satterfield, G. M. Kavanaugh, and H. Resnick. July 1950. 48p. (NP-1760)

The results of studies of the explosive characteristics of hydrogen peroxide vapor at atmospheric and sub-atmospheric pressures are presented. It was found that at atmospheric pressure, vapors containing 26 mole % or more of H_2O_2 could be exploded by a hot wire, and that this explosive limit was essentially unchanged by variations in the wire temperature or variations in the H_2O to O_2 ratio in the diluent gas. At 200 mm Hg, the limiting explosive composition has increased only to approximately 33 mole %, but then increases rapidly with a further decrease in pressure. Vapors lying within the explosive region at 1 atm total pressure may be exploded by contact with catalytically active materials initially at room temperature or by "noncatalytic" materials like Al at temperatures of 150°C or higher. Because of the explosive hazards involved, some description is given of the techniques used for satisfactory production of concentrated H_2O_2 vapor at atmospheric pressure. Work is continuing on the studies of explosion limits at sub-atmospheric pressure, and on the effect of the nature of the initiating source on the explosion limit. (auth)

2118

THE FORMULA OF SODIUM PARATUNGSTATE. K. Saddington and R. W. Cahn. J. Chem. Soc., 3526-9(1950) Dec.

The variations in the formulas ascribed to the paratungstates are recalled. The results of some new chemical analyses on sodium paratungstate crystals are given, with data obtained by goniometric measurements and by x-ray-diffraction studies of the crystals. From these it is concluded that the crystalline salt has the composition $Na_{10}W_{12}O_{41}\,28H_2O$, and an attempt is made to correlate this formula with the formula $[HW_6O_{21}]^{-5}$ suggested by Jander for the paratungstate anion. (auth)

2119

KINETICS OF THE REACTION OF LITHIUM BOROHYDRIDE IN AQUEOUS ACID SOLUTION. Martin Kilpatrick and C. Dana McKinney, Jr. J. Am. Chem. Soc. 72, 5474-6 (1950) Dec.

The reaction of alkaline solutions of lithium borohydride with sulfuric acid solutions was studied. The reaction was found to occur in two steps. The first involved the formation of diborane, which was hydrolyzed in the second step. The rate measured was that of the first step, and the reaction was first order with respect to lithium borohydride and hydrogen ion.

2120

NOTE ON SILVER METAVANADATE. L. Malaprade. Bull. soc. chim. France, 765-6(1950) Sept.-Oct. (In French)

The ratio of V to Ag in $AgVO_3$ precipitates has been found to vary from 0.96 to 1.04 by different investigators. The present note reports the effect on this ratio of precipitation from $AgNO_3$ and NH_4VO_3 solutions of variation in temperature, of the presence of acetate and ammonium ions, and of heating at 260°C.

2121

A SOLUBLE BASIC SELENATE OF BERYLLIUM. M. F. Puche. Bull. soc. chim. France, 763-5(1950) Sept.-Oct. (In French)

The limits of solubility of $Be(OH)_2$ in solutions of $BeSeO_4$ and the kinetics of its solution have been studied. Evidence for the existence of a soluble basic selenate of probable formula $BeO(SeO_3)_2$ analogous to $BeO(SO_3)_2$ is presented. The possibility of an insoluble selenate of even greater basicity is not excluded.

2122

THEORETICAL ANALYSIS OF THE CURRENT DENSITY DISTRIBUTION IN ELECTROLYTIC CELLS. Carl Wagner. J. Electrochem. Soc. 98, 116-28(1951) Mar.

The current distribution at plane electrodes of finite breadth is calculated under the assumption of a linear polarization curve. The current distribution at triangular-wave profile electrodes is calculated for zero polarization, and an approximate solution is given for high polarization. Results of the theoretical analysis are compared to other experimental data. It is shown how measurements with the Haring cell can be used to predict current-density distributions for other geometrical conditions. (auth)

ANALYTICAL PROCEDURES

2123

Commissariat à l'Énergie Atomique
CONCERNING DIFFERENTIAL POLAROGRAPHY WITH A SINGLE DROPPING ELECTRODE. J. chim. phys. 47, No. 7-8(1950). P. Lévêque and F. Roth. 1950. 1p. (CEA-57)

A priority question is discussed concerning the application of a circuit and a galvanometer in polarography described by the authors in J. chim phys., No. 9-10, (1949).

2124

ELECTRODES OF SOLID METALS REPLACING THE MERCURY DROP ELECTRODE; trans. from Zavodskaya Lab. 14, No. 2, (1948). July 26, 1950. 4p. (NP-2192)

This is a collated report on the following three papers, published in the Russian journal, Zavdoskaya Lab. 14, No. 2 (1948) and describing attempts to replace the mercury drop electrode by solid metal electrodes: Shobets et al., p.131 Lyalikov et al., p.138 and 144. The electrodes used were rotating amalgamated Ag and Pt needles, or periodically dipping Pt needles surrounded by a bubbling gas. They were employed for determinations of metal-ion concentrations in salt melts, i.e., under conditions where the use of the mercury drop electrode would be impossible.

2125

AN ISOTOPE DILUTION METHOD FOR NUCLEIC ACID ANALYSIS. I. PURINES. Richard Abrams. Arch Biochem. 30, 44-51(1951) Jan.

A C^{14} isotope dilution method has been developed for accurately determining the purine composition of nucleic acids. Typical analysis on pancreas ribonucleic acid, yeast ribonucleic acid, and thymus desoxyribonucleic acid have indicated a widely varying composition. (auth)

2126

ON THE THERMOGRAVIMETRY OF ANALYTICAL PRECIPITATES. XLII. DETERMINATION OF HALOGENS. Thérese Dupuis and Clement Duval. Anal. Chim. Acta 4, 615-22(1950) Dec. (In French)

The authors have traced, with the help of the Chevenard thermobalance, the pyrolysis curves of the precipitates which serve for the gravimetric determination of F, Cl, Br, and I as simple as well as complex ions. Eleven new methods are proposed which are suitable for automatic gravimetric determinations. On the other hand, it is recommended that the methods using thorium silicofluoride, lead iodide, and benzidine iodate be dropped. The best methods for F are those in which $(C_6H_5)_3SnF$, UOF_2, PbFCl, or BiF_3 are precipitated. Of the silver halides, the bromide is the most stable. (auth)

2127

Commissariat à l'Énergie Atomique
POLAROGRAPHIC DETERMINATION OF URANIUM IN AN ACID MEDIUM AND IN THE PRESENCE OF IRON, COPPER, AND PHOSPHATES. E. Bloche, P. Lévêque, and H. Provisor. Bull. soc. chim. France (5) 16, 831-2(1949). 1949. 3p. (CEA-24)

A polarographic determination of U, using the polarographic wave corresponding to the transition $U^{+6} - U^{+5}$, can be conveniently done in the presence of Fe^{+3} and Cu^{++}, the only interfering cations, if Fe^{+3} has been reduced with SO_2 in the presence of $(NH_4)_2SO_4$; the latter substance acts as a stabilizer in preventing reoxidation of Fe^{++} while the excess SO_2 is being removed by ebullition. In the presence of phosphates the formation of uranyl complexes must be prevented by an addition of Fe^{+3} ions; this latter procedure will be described in more detail elsewhere.

2128

THE SPECTROGRAPHIC ANALYSIS OF URANIUM IN URANIUM ORES. A. Strasheim. Spectrochim. Acta 4, No. 3, 200-11(1950).

Three methods for the spectrographic determination of the U content of ores are described. These methods are (a) direct evaporation of the sample with graphite as arc stabilizer in a d-c arc, (b) the prior extraction of the U from the ores before proceeding as in (a), and (c) the direct burning of the sample in a d-c arc with an enhancing agent. The sensitivites and accuracies of the methods are given, from which it follows that U contents of ores as low as 0.006% U_3O_8 can be analyzed directly, according to the third procedure, with an accuracy of 11%. For the analysis of ores containing high percentages of Ca, the extraction procedure is recommended. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

2129

THE CRYSTAL STRUCTURE OF $Th(OH)_2SO_4$. Georg Lundgren. Arkiv Kemi 2, No. 6, 535-49(1951).

Preparation of crystals based on addition of conc. H_2SO_4 to a saturated solution of $Th(NO_3)_4$ is outlined, and analysis of the sulfate, Th, and water in the crystals is described. Based on considerations of unit cell, space group, and positions of the light atoms, nonsulfate O atoms, and sulfate groups, the final proposed structure is described. The structure proposed for $Th(OH)_2SO_4$ is formed by two almost parallel rows of OH^- ions held together by Th atoms situated on alternate sides of the OH^- rows. The chains run in the direction of the y axis. They are held together by sulfate groups, each of which is in contact with three different chains. The Th atoms are surrounded by 8 O atoms (4 hydroxide and 4 sulfate O atoms) forming two almost parallel, somewhat distorted squares turned at an angle of 45 deg to each other. The coordination polyhedron formed in this way, the square Archimedean antiprism, gives a more satisfactory ionic coordination than the cube. The xz and xy projections of the structure are shown. The distances Th–O, S–O, and O–O (within a sulfate group) were assumed to be about 2.4_0, 1.4_7, and 2.4_0 A. The distances between O atoms not belonging to the same sulfate group are listed.

FLUORINE AND FLUORINE COMPOUNDS

2130

HALOGENATION IN THE LIQUID PHASE BY MEANS OF CHLORINE TRIFLUORIDE. J. F. Ellis and W. K. R. Musgrave. J. Chem. Soc., 3608-12(1950) Dec.

When benzene (1 mole) in CCl_4 solution, and in the presence of a variety of catalysts, is treated with ClF_3 (0.5 mole) the main reaction is one of substitution, and the products are chlorobenzene and fluorobenzene. Some halogenated addition compounds are also produced in smaller quantities, and in certain cases products suspected to be halogenated diphenyls are formed. (auth)

2131

THE HEAT OF FORMATION OF IODINE PENTAFLUORIDE. A. A. Woolf. J. Chem. Soc., 231-2(1951) Jan. (Note)

The determination of the heats of formation of certain halogen fluorides by utilizing their quantitative reactions with oxides has been suggested (Emeléus and Woolf, J. Chem. Soc., 164(1950)). The heat evolved in the simplest of these reactions, the hydrolysis of IF_5, has now been measured and leads to a value of 204.7 kcal for the reaction $\frac{1}{2}I_2(s) + 2\frac{1}{2}F_2(g) = IF_5(l)$ at 18°C, and 194.6 kcal for the reaction to yield the gaseous pentafluoride. The latent heat of

vaporization, 10.1 kcal, was calculated from Ruff and Braida's vapor-pressure equation (Z. anorg. u. allgem. Chem. 214, 91(1933)).

2132

METALLURGICAL REACTIONS OF FLUORIDES. Herbert H. Kellogg. J. Metals (N.Y.) 191, 137-41(1951) Feb.

Graphs representing the standard free energy of formation as a function of temperature for 21 fluorides are presented, along with estimated values for the standard free energy of formation of 20 additional fluorides. A few of the many possible uses of these data in metallurgical calculations are discussed, including the fluorination of oxides, sulfides, and chlorides, and the reduction of metal fluorides. (auth)

2133

ORGANIC FLUORIDES. PART V. FLUORINATION OF HYDROCARBONS WITH COBALT TRIFLUORIDE. R. N. Haszeldine and F. Smith. J. Chem. Soc., 3617-23(1950) Dec.

The fluorination of hydrocarbons is more readily achieved by the use of cobalt trifluoride than by treatment with fluorine in the presence of a catalyst. The control of the conditions is not as critical, and polymerization and decomposition are greatly reduced. Higher yields of fluorocarbons are obtained from unsaturated than from saturated hydrocarbons. (auth)

2134

PERFLUORO-TERT.-AMINES. R. N. Haszeldine. J. Chem. Chem. Soc., 102-4(1951) Jan.

The passage of tertiary amines over cobalt trifluoride gives the corresponding perfluoro-tert-amines in small yield. The physical properties of these compounds are compared with those of fluorocarbons of similar volatility. The fluorination of the tertiary amines was accompanied by extensive decomposition and possibly by rearrangement, and the low yields of the perfluoro-tert-amines are attributed in part to nonvolatile hydrofluoride formation. The seven perfluoro compounds prepared were: $N(CF_3)_3$, $N(CF_3)_2(C_2F_5)$, $N(CF_3)(C_2F_5)_2$, $N(C_2F_5)_3$, $N(C_3F_7)_3$, $N(C_3F_7)_2$(iso-C_4F_9), and $N(C_4F_9)_3$. The boiling points of these compounds lie on a smooth curve. The boiling points of the parent tertiary amines are also recorded and are seen to lie substantially above those of the fluorinated compounds. A comparison of the boiling points of the fluorocarbons and the perfluoro-tert-amines reveals that the latter, $C_nF_{2n+3}N$, have a volatility similar to the fluorocarbons, $C_{n+1}F_{2n+4}$, derived from the *n*-paraffins. Hence, replacement of a C atom in a fluorocarbon by N, although it gives a compound containing one less F atom, has little effect on the boiling point.

2135

SIMPLE AND COMPLEX FLUORIDES OF SOME NOBLE METALS. A. G. Sharpe. J. Chem. Soc., 3444-50(1950) Dec.

Bromine trifluoride has been used as fluorinating agent in the preparation of platinum tetrafluoride, rhodium tetrafluoride and palladium trifluoride from halides of these metals. Platinum tetrafluoride dissolves in the reagent, yielding a compound $PtBr_2F_{10}$, which undergoes partial reation with potassium tetrafluorobromite (bromotetrafluoride), forming a mixture from which pure potassium hexafluoroplatinate may be separated by a procedure based on the widely different rates of hydrolysis of PtF_4 and the $[PtF_6]^{--}$ ion. Rhodium tetrafluoride and palladium trifluoride also yield complex fluorides, but these are unstable to water and have not been obtained pure. Complex fluoride ions are generally the least stable of complex halide ions of noble metals, the stability increasing from fluoride to iodide; the value of this stability sequence is illustrated in the preparation of sodium hexabromoplatinate and potassium tetrabromopalladite by heating the accessible complex chlorides with hydrobromic acid. Substitution reactions of the hexafluoroplatinate ion, $[PtF_6]^{--} + 6X^- = [PtX_6]^{--} + 6F^-$, where X = Cl, Br, or I, are hydrogen-ion catalyzed; the rate-determining step is the first, and x-ray powder photography shows that products intermediate in composition between K_2PtF_6 and K_2PtBr_6 are not isolated in the reaction between potassium hexafluoroplatinate and hydrobromic acid. (auth)

2136

A SUPPLEMENT TO THE STUDY OF THE ABSORPTION SPECTRUM OF HYDROFLUORIC ACID GAS IN THE ULTRAVIOLET. Jacques Romand and Ebrahim Safary. Compt. rend. 231, 1050-2(1950) Nov. 13. (In French)

Previously reported investigations on the ultraviolet absorption spectrum of HF (Safary and Romand, Compt. rend. 229, 1003(1949)) have been extended to the effect of temperature elevation. Absorption spectra at 16.5, 53, 100, and 165°C are presented. An increasing trend in absorption with increasing temperature to a maximum at 1612 A is exhibited. Reasons for interpreting the spectrum at 165°C as that of monomeric HF are given.

GRAPHITE

2137

National Bureau of Standards
SUMMARY REPORT ON STRESS RUPTURE AND CREEP TESTING OF COATED AND UNCOATED GRAPHITE AND BERYLLIUM CARBIDE AT ELEVATED TEMPERATURES; [JULY 1948 TO JULY 1950]. B. Zweig and M. D. Burdick. July 24, 1950. 20p. (NEPA-1511)

Controlled-atmosphere creep furnaces have been built for determining creep data of uncoated graphite. Creep rates are presented for three grades of graphite. Coated-graphite specimens were tested in creep furnaces in air. The silicon carbide coating appeared to be most effective as a protection for the graphite under conditions of heat and stress. (auth)

2138

SOME PHYSICAL PROPERTIES ASSOCIATED WITH "AROMATIC" ELECTRONS. PART III. THE PSEUDO-METALLIC PROPERTIES OF POTASSIUM-GRAPHITE AND GRAPHITE-BROMINE. F. R. M. McDonnell, R. C. Pink, and A. R. Ubbelohde. J. Chem. Soc., 191-7(1951) Jan.

Graphite is known to form "lamellar compounds" C_8K and C_8Br by absorption of potassium and bromine, respectively. Physical properties of these compounds have been studied to elucidate the nature of the bonding, and its effects on the aromatic π electrons in graphite. The marked diamagnetism associated with the π electrons in graphite is destroyed in both compounds. C_8Br is weakly diamagnetic, and C_8K shows a temperature-independent paramagnetism of the same order as for metallic calcium. Both compounds are better conductors of electricity than is graphite. A tentative interpretation of these effects is given in the light of the band theory of the energy levels in graphite. The layers of fused aromatic nuclei are regarded as amphoteric, and can both take up electrons from the K atoms, and give them up to the Br atoms, yielding pseudometallic structures in both cases. Magnetic and electrical data on a compound of formula C_4F whose structure has not yet been established by other means suggest a general similarity in behavior with graphite. (auth)

LABORATORIES AND EQUIPMENT

2139

THE RADIOACTIVE ISOTOPE LABORATORY UNIT AT TECHNICAL DEVELOPMENT SERVICES. Jens A. Jensen. Comm. Disease Center Bull., 26-8(1950) Nov.

Laboratory equipment and facilities for the medium-sized organization of Technical Development Services, Savannah, Ga., are described.

RADIATION CHEMISTRY

2140

SOME EXPERIMENTS ON P^{32}. I. PHYSICAL PROCEDURES AND MEASUREMENTS. Sakae Shimizu, Yoshiaki Uemura, Ryutaro Ishiwari, Osamu Horibe, and Sunao Okamoto. Bull. Inst. Chem. Research Kyoto Univ. 22, 72-3(1950) Sept. (Abstract of paper presented at meeting of Institute, June 10-11, 1950)

Production of radioactive phosphorus, P^{32}, by the reaction $S^{32}(n,p)P^{32}$ is reported. The irradiation was carried out using 3.8 liters of CS_2 in a spherical flask with a 50-mg Ra-Be neutron source placed at the center of the flask.

2141

SOME EXPERIMENTS ON P^{32}. II. CHEMICAL PROCEDURE. Senji Utzino, Syuzo Akashi, Minoru Fukuda, Hiroaki Akagi, and Tetsuya Hanai. Bull. Inst. Chem. Research Kyoto Univ. 22, 73-4(1950) Sept. (Abstract of paper presented at meeting of Institute, June 10-11, 1950)

Chemical separation of radioactive phosphate from irradiated CS_2 (from the reaction $S^{32}(n,p)P^{32}$) is described in the abstract. The procedure is based on extraction of P^{32} from CS_2 as radioactive H_3PO_4, using HNO_3 as oxidant and I_2 as catalizer followed by isolation of $H_3P^{32}O_4$ with carrier phosphate.

RADIATION EFFECTS

2142

THE ACTION OF IONIZING RADIATIONS AND OF RADIOMIMETIC SUBSTANCES ON DEOXYRIBONUCLEIC ACID. PART II. THE EFFECT OF OXYGEN ON THE DEGRADATION OF THE NUCLEIC ACID BY X-RAYS. J. A. V. Butler and B. E. Conway. J. Chem. Soc., 3418-21(1950) Dec.

Degradation of the nucleic acid by x rays, as shown by the decrease of viscosity, ceases when irradiation ceases provided that the solution has been prepared and irradiated under oxygen-free conditions. The aftereffect is thus due to a product of molecular oxygen. The product is not hydrogen peroxide, since this cannot be detected in nucleic acid solutions irradiated in oxygen. (auth)

2143

THE ACTION OF IONIZING RADIATIONS AND OF RADIOMIMETIC SUBSTANCES ON DEOXYRIBONUCLEIC ACID. PART III. THE MOLECULAR WEIGHTS OF DEOXYRIBONUCLEIC ACID DEGRADED BY X-RAYS AND BY TREATMENT WITH A "NITROGEN MUSTARD." B. E. Conway, L. Gilbert, and J. A. V. Butler. J. Chem. Soc., 3421-5 (1950) Dec.

Molecular weights of deoxyribonucleic acid in aqueous solutions, both untreated and degraded by treatment by x rays of di-(2-chloroethyl)-methylamine, have been determined by sedimentation and diffusion-constant determinations. The degraded materials have molecular weights which are markedly less than those of the original nucleic acid and exhibit a considerable degree of polydispersity. (auth)

2144

CHEMICAL ACTIONS OF IONISING RADIATIONS IN SOLUTION. PART VII. RADIATION CHEMISTRY OF STEROLS. THE ACTION OF X-RAYS ON CHOLIC ACID IN AQUEOUS SOLUTION. Max Keller and Joseph Weiss. J. Chem. Soc., 25-6(1951) Jan.

The action of x rays on aqueous solutions of sodium cholate gives, as main product, 3(α),12(α)-dihydro-7-ketocholanic acid. This substance is also formed in the first stages of the biological oxidation of cholic acid, thus showing again the parallelism between certain biological oxidations and those produced by penetrating radiations in aqueous systems. (auth)

2145

DEAMINATION OF AQUEOUS SOLUTIONS OF l-SERINE BY X-RADIATION. W. M. Dale and J. V. Davies. Nature 166, 1121(1950) Dec. 30. (Letter to the editor)

The yield of ammonia from irradiated glycine and other amino acids shows a continuous rise with increasing concentration to nearly saturated solutions. In order to show that the rise of yield, which cannot be expected to continue indefinitely, levels off, l-serine, combining high solubility and high ionic yield, was irradiated at various concentrations with 166,000 r of x rays. The deamination curve

of l-serine levels off at high concentrations in contrast to the glycine curve.

2146

ON THE POLYMERIZATION OF VINYLIC COMPOUNDS INITIATED BY γ RAYS. I. Adolphe Chapiro. J. chim. phys. 47, 747-63(1950) Sept.-Oct. (In French)

The kinetics of γ-ray-initiated polymerization of styrene in various diluents has been studied. The addition of small quantities of diluent to the monomer generally produces an acceleration of the polymerization, due to the "fragility" of the diluent molecules to γ rays; styrene itself is very stable. The relative fragility of the diluent may be defined with respect to the monomer. When the diluent is a poor solvent for the polymer, the observed results are very complicated because of the precipitation of the polymer in the reaction region. 10 figures. 41 references.

2147

ON THE POLYMERIZATION OF VINYLIC COMPOUNDS INITIATED BY γ RAYS. II. Adolphe Chapiro. J. chim. phys. 47, 764-75(1950) Sept.-Oct. (In French)

The study of polymerization by γ rays, already reported for styrene, has been extended to methyl methacrylate, acrylonitrile, vinyl acetate, vinyl chloride, methyl acrylate, and butadiene. The results observed permit clarification of the action of precipitants on the kinetics of the polymerization and in particular on the nature of the "gel effect" and post-polymerization. In addition, γ-ray polymerization serves as a method for studying the action of radiation on organic liquids and may contribute importantly to radiochemistry. 47 references.

SEPARATION PROCEDURES

2148

Knolls Atomic Power Lab.
BATCH COUNTERCURRENT EXTRACTION OF RADIOACTIVE SOLUTIONS. Walter O. Haas and Edward L. Zebroski. Nov. 8, 1950. 14p. (KAPL-P-243)

Procedures are given for carrying out continuous countercurrent batch extractions for simple extraction columns and for compound columns with reflux. Criteria for approach to steady-state conditions and methods of sampling are discussed. The procedures are particularly applicable to studies of the behavior of radioactive or biological solutions when it is desired to minimize the amount of material handled. Details of a simple extraction battery suitable for remote manipulation are given. (auth)

2149

North American Aviation, Inc.
THE ISOLATION OF RADIOCHEMICALLY PURE 2.6-YEAR SODIUM FROM DEUTERON BOMBARDED NaK ALLOY. E. E. Motta. Dec. 4, 1950. 9p. (NAA-SR-106)

Cyclotron targets containing stable Na^{23} as NaK alloy have been bombarded with deuterons of sufficient energy to yield the 2.6-yr Na^{22} by the (d,p2n) reaction. To obtain the Na in a radiochemically pure form so that it would be useful for general tracer research, a laboratory procedure for the isolation and purification of this activity has been developed. Removal of the Na from possible contaminants, namely, traces of radioactive Fe, Ni, Co, Zr, Cr, Ca, Nb, and Mn has been carried out. In addition the separation of Na from K has been effected to yield pure NaCl containing the Na^{22} activity. (auth)

2150

THE PREPARATION OF CARRIER-FREE THORIUM^{234} (UX_1) BY ION EXCHANGE. David Dyrssen. Svensk Kem. Tid. 62, 153-64(1950) July. (In English)

Previous methods used to extract UX_1 are reviewed. Some column variables affecting the adsorption of UX_1 in ion-exchange resins are considered. Radioactive measurements can be made directly on the ion-exchange columns. The desorption of UO_2^{++} and Fe^{+3} from Wofatit KS with 2M HCl is shown. A simple method of preparing carrier-free UX_1 is described. In this procedure UX_1 and U are separated in an ion-exchange column with 2M HCl, after which UX_1 is eluted from the column with 0.5M oxalic acid. (auth)

2151

SEPARATION BY ION EXCHANGE OF TRACES OF Ac^{227} FROM A LARGE AMOUNT OF LANTHANUM. Yang Jeng Tsong. J. chim. phys. 47, 805-6(1950) Sept.-Oct. (In French)

An ion exchange column of Amberlite IR-100 and a 5% ammonium citrate eluant at pH 5.5 have been used to separate 3 mc of Ac^{227} from 200 mg of La. A single elution gave a product with specific activity about 5 mc/mg.

SPECTROSCOPY

2152

A RECORDING GRATING SPECTROMETER WITH LINEAR WAVELENGTH SCALE. George P. Koch, William J. Taylor, and Herrick L. Johnston. J. Optical Soc. Am. 41, 125-30(1951) Feb.

A large Wadsworth grating spectrometer designed primarily for photoelectric recording is described. Important features of the instrument are an arrangement which permits any wavelength interval up to the full range of the spectrometer to be scanned in one continuous operation and a wavelength scale which is linear over the entire spectral range (2000 to 14,000 A). The linear scale results in part from scanning the spectrum on the grating normal, a condition which leads also to minimum aberrations in the spectral image. Provision is made for indicating on the spectrum record reference marks which denote equal increments of wavelength. Multiplier phototubes operating at liquid-nitrogen temperature are used in the photoelectric recording system. The scanning slit (or photographic plate) is maintained automatically on the focal curve by a simple focusing device. The spectrometer is fully adaptable to photographic work and may be converted from photoelectric recording to photographic recording (or vice versa) in about 5 min. (auth)

2153

THE USE OF PHOTOMULTIPLIERS IN SPECTROSCOPY. Daniel Glansholm and Bengt Kleman. Arkiv Physik 2, No. 4, 305-20(1950).

Some characteristics of photomultipliers in connection with their use in spectroscopic research are reported. Automatic recording was done by a scanning method. The mechanical construction, which is very simple, can be applied directly to an ordinary spectrograph designed for photographic recording. Different objects have been investigated, and the efficiency of the photoelectric method as a supplement to the photographic is discussed. The photomultiplier, linearity, fatigue, noise, dark current, spectrograph, light source, and recording method are described. Reproductions of results are included.

SYNTHESES

2154

Argonne National Lab.
PROGRESS REPORT; RADIOBIOLOGY EXPERIMENT STATION, p.152-4 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. Austin M. Brues, Director. [nd.] 3p. (ANL-4401(p.152-4))

An effort is being made to biosynthesize radioactive forms of several plant compounds for subsequent use as tracers. The first compounds to be biosynthesized will be radioactive forms of vitamin B_{12} and rutin. The feasibility of incorporating Co^{60} and/or P^{32} and C^{14} in Streptomycin griseus, one of the sources of B_{12}, is being investigated. Young buckwheat plants will be cultured in the nutriculture growth chamber for the biosynthesis of C^{14}– containing rutin. Two significant results are apparent from the experiment designed to show the effects of slow neutrons on growth and development of hemp plants following irradiation of seeds: (1) low doses resulted in a greater per cent germination than in the nonirradiated controls; and (2) there was an increase in the incidence of intersexing of plants developed from irradiated seeds compared with nonirradiated seeds.

2155

Radiation Lab., Univ. of California
SYNTHESIS OF SEVERAL C^{14}-LABELED dl-ALANINES. R. Ostwald, P. T. Adams, and B. M. Tolbert. Oct. 13, 1950. 13p. (UCRL-962)

The synthesis of the three mono-C^{14}-labeled dl-alanines and necessary intermediates to prepare them via propionic acid is described. Small-scale procedures were used throughout. Ion exchange columns and vacuum sublimation were used to give high-purity amino acids in good yield on a small scale. (auth)

2156

PREPARATION OF TITANIUM TETRACHLORIDE FROM RUTILE. C. H. Gorski. J. Metals (N.Y.) 191, 131-3(1951) Feb.

A method for preparing $TiCl_4$ is described which consists of reducing rutile with coke at 1100 to 1400°C and chlorinating the reduced product at 200 to 500°C. The crude distillate is purified by treatment with copper powder and distillation. Recoveries, exceeding 90% of the titanium in the rutile, were obtained. (auth)

TRACER APPLICATIONS

2157

DETERMINATION OF THE SOLUBILITY OF TANTALUM HYDROXIDE IN SULFURIC ACID BY A RADIOACTIVE INDICATOR METHOD. M. M. Haissinsky and Renée Bovy. Bull. soc. chim. France, 827-9(1950) Sept.-Oct. (In French)

The solubility of $Ta(OH)_5$ freshly precipitated from concentrated H_2SO_4 has been determined with tracer Ta^{182} to be of the order of several milligrams per liter. The solubility increases with the concentration of acid up to 10N, then appears to decrease, but the determination becomes less and less reproducible. The behavior, which is similar to that of $Pa(OH)_5$, of the hydroxide in highly concentrated acid is attributed to a dehydrating action on the precipitate.

2158

National Research Council of Canada
THE USE OF TAGGED ATOMS IN THE STUDY OF THE PHENOMENA OF ADSORPTION AND CATALYSIS; trans. from Uspekhi Khim. 19, 59-87(1950). N. P. Keĭer; tr. by E. Rabkin. 1950. 78p.

An abstract from the Russian of the original paper appeared in Nuclear Science Abstracts as NSA 4-3947.

TRANSURANIC ELEMENTS AND COMPOUNDS

2159

SOME ASPECTS OF THE CHEMISTRY OF THE HEAVY ELEMENTS. A. W. Wylie. Roy. Australian Chem. Inst. J. Proc. 17, 446-61(1950) Dec.

Following a discussion of elements 89 through 98 which covers occurrence and synthesis, their places in the periodic classification, the uranide hypothesis, etc., the author reaches the following conclusions. Even if it is eventually possible from physical evidence to decide unambiguously whether the heaviest elements contain 5f or 6d electrons (or both), on chemical grounds it is clearly difficult to reach an unequivocal decision as to the exact place of these elements in the periodic classification. With the heaviest elements there appears to be a certain lack of correspondence between electronic configurations and chemical properties, not noticeable with lighter elements. This is presumably caused by the closeness in energy of the 5f and 6d orbitals, the difference in energy of these levels being of the order of chemical binding energies. It is thus possible that different atomic configurations may obtain, depending on whether the atoms are in the gaseous state or in one state of combination or another. In the ion

Th^{+3}, for instance, the 5f-6d level separation has been given as 9193 cm^{-1}, equivalent to a separation of 26.05 kcal/mole. This comparatively small difference may account for the lack of correspondence between the properties of the Th^{+3} ion, which in the gaseous state is believed to contain a single 5f electron and in the compounds ThI_3 an and ThI_2 is believed to contain 6d electrons only. It seems likely that the configuration 6d is stablized relative to the configuration 5f when gaseous ion is condensed into a solid (or liquid) phase, perturbations by the lattice or by the hydration shell reversing the expected energy levels. Perhaps the most satisfactory solution to the problem is that preferred by Paneth (Discovery 9, 286(1948); Nature 165, 748(1950)) and Haissinsky (J. Chem. Soc. S241(1949)). The cisuranic elements are left in their traditional places in the periodic classification, and the transuranic elements are placed as a group below U. The position of the transuranic elements under group VIa then satisfactorily describes some of the more obvious resemblances between the higher oxidation states of all the elements, and the appearance of 5f electrons in U (or earlier) suffices to account both for the amply demonstrated similarities between U and the transuranic elements, and also for the manifest differences between those elements and their 3d, 4d, and 5d cogeners of the same group which possess no f electrons. 38 references.

ENGINEERING

HEAT TRANSFER

2160

Institute of Engineering Research, Univ. of California
INVESTIGATION OF CONVECTIVE HEAT TRANSFER IN SYSTEMS IN WHICH LIQUID LEAD-BISMUTH ALLOY IS USED AS THE MEDIUM; QUARTERLY PROGRESS REPORT; 1 JUNE TO 31 AUGUST 1950. H. A. Johnson. Sept. 11, 1950. 11p. (ORO-6)

Experimental. In an attempt to explain lower values of the heat-transfer coefficient reported elsewhere two investigations were initiated, one concerning the effect of the seal gas, and the second checking the effectiveness of the bond between the sprayed-on copper and the steel pipe of the heat exchanger. It is determined that if nonwetting is occurring the effect of additional gas-film resistance may be reduced but not eliminated by the use of a high-conductivity seal gas. The second investigation indicated that the bonding between the Cu jacket and the steel tube of the test section was ineffective, and a micrograph indicated that a void was present between the two faces. This additional resistance of the void was neglected in the calculations and therefore a false lower value of the heat-transfer coefficient was obtained.

Design. A new loop for the measurement of the heat-transfer coefficient of Pb-Bi eutectic in turbulent pipe flow at temperatures up to 1000°F and Peclet numbers up to 12,500 is being designed and detailed. The possibility of using the loop for heat-transfer measurements of Hg is also being considered in the design. A schematic diagram of the system is shown.

Analytical. Theoretical considerations (R. Bailey, ORNL-521) are reviewed on the heat transfer to a molten metal flowing in an annulus. This review has indicated that the 1/7th-power-law velocity distribution can be used for the representation of the velocity distribution in the annulus to a degree almost as satisfactory as that of the velocity distribution. The assumption of the 1/7th-power-law distribution leads to an expression for the average friction factor which is essentially the same as the magnitude obtained by use of the equivalent diameter of the annulus in the usual expressions as employed for flow in circular pipes. The expressions for the heat-transfer coefficient which follow from these assumptions yield magnitudes of the heat-transfer coefficient similar to those of Bailey for the few points so far calculated. Values of the coefficient for the flow of heat into the exterior of the annulus with the interior wall adiabatic have been determined.

2161

LIQUID METAL HEAT-TRANSFER COEFFICIENTS. Richard N. Lyon. Chem. Eng. Progress 47, 75-9(1951)Feb.

In a discussion of the use of liquid metals as heat-transfer media a qualitative diagram of temperature distribution in fluids of various Prandtl moduli is presented as the current concept of turbulent flow in a tube. A general equation for the heat-transfer coefficient in tubes is developed for the following specifications: steady state, constant physical properties of fluid, no end effects, system symmetrical about tube axis, and constant heat flux along the tube wall in one direction. Comparisons of theoretical and experimental values for liquid-metal heat transfer are made. 15 references.

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

2162

NEW METHOD MACHINE. Alvin S. Cohan. J. Metals (N. Y.) 3, 216-7(1951) Mar.

Cutting, threading, drilling, forming, and other machining operations on fully sintered cemented carbides and borides, stellites, hardened tool and die steels, and other hard and brittle materials such as glass, rubies, sapphires, and diamonds are performed by a new machining method known as the Cavitron process. The Cavitron process uses ultrasonic vibrations. Unlike conventional machining methods, Cavitron employs a blunt tool in the shape of the cut or hole to be made in the work. It operates head on into the work by vibrating 27,000 times per sec. High vibrating frequencies impart to the work tool accelerations in the order of 70,000 times the acceleration caused by gravity. The actual cutting is done by a stream of inexpensive commercial abrasive, which is fed into the work area in a liquid carrier.

2163

SURFACE DIFFUSION IN SINTERING OF SPHERES ON PLANES. P. Schwed. J. Metals (N. Y.) 3, 245-7(1951) Mar. (Technical Note)

Calculations have been performed without restriction on the region of diffusion of the case where a sphere is sintered on a plane. These are in turn compared with a case (1) where, in treating the mechanism of surface diffusion, it was postulated that the concentration gradient of vacancies is different from zero only within the neck, and (2) that diffusion occurs only in the region outside the neck.

METALS AND METALLURGY

2164

Carnegie Inst. of Tech.
PROGRESS REPORT FOR JULY, AUGUST, SEPTEMBER, 1950. R. Smoluchowski, M. Achter, L. Couling, R. Flannagan, S. Hayes, A. Opinsky, B. Sawyer, and R. W. Turner. Feb. 23, 1951. 4p. (NYO-518)

The study of the influence of grain orientation on intergranular diffusion of Ag in Cu is reported. The results can be closely related to the dislocation model of grain boundary. The study of slip in body-centered cubic lattices yielded accurate relative values of critical shear stresses in Fe-Si alloys.

2165

Sintercast Corporation of America
PROGRESS REPORT FOR AUGUST 1, 1950 - OCTOBER 31, 1950. C. G. Goetzel and R. B. Wagner. Nov. 1, 1950. 25p. (NYO-688)

The production of ZrC from ZrO_2 was developed to the point where uniform 1000-g batches of the carbide, containing 9 to 10% combined C and less than 0.5% free C, are being produced. Recarburization, in vacuum, of this product for the purpose of increasing the combined C content was also undertaken. Cemented ZrC test specimens, containing 10 and 20% Fe and Ni, were produced and some of their physical properties were tested. An investigation of the influence of hot-pressing and cold-pressing and sintering process variables on some of the physical properties of the test specimens was carried out. The design of an atmosphere hot-press was completed and a vacuum recarburization furnace for ZrC production constructed. A drawing and description of an atmosphere hot-press, per cent analysis of ZrC, particle size analysis of ZrC powder, room temperature modulus of rupture of specimens of ZrC compounds, structure of ZrC-10% Fe specimens sintered at 2100°C for 2 hr in H, N, and He, respectively, and other data are included.

2166

Institute of Engineering Research, Univ. of California
METALLURGICAL INVESTIGATION OF MATERIALS SUBJECTED TO LIQUID LEAD-BISMUTH ALLOY ENVIRONMENT; PART I; PROGRESS REPORT; JUNE 1 TO AUGUST 31, 1950. Sept. 1950. 5p. (ORO-19)

Stress rupture data, for specimens wetted prior to testing, have been obtained for Sicromo 5S and AISI-430 steels at 1000°F. Tests are in progress, at 1000°F, on AISI-310 for both wetted and helium only conditions. Stress-rupture data have been analyzed graphically. The tests in He alone are represented by a least squares curve, whereas plotted points are for specimens wetted and tested in Pb-Bi eutectic. The standard deviation of test points is also indicated on the curves. The decrease in strength of Timken steel 17-22A in Pb-Bi as compared to no decrease for Sicromo 5S is in accord with micrographic observation which revealed surface attack only for 17-22A.

2167

Sylvania Electric Products, Inc.
ATTACK-POLISH METHOD OF METALLOGRAPHIC PREPARATION. D. Boyd Metz and Harry W. Woods. Oct. 30, 1950. 11p. (SEP-42)

A method has been developed for the preparation of all types of metallographic specimens. The procedure consists of a conventional mechanical polish with 2/0 or 3/0 jewelers' paper, followed by wheel polishing using a mixture of a common etchant and polishing powder. This etch-polish method was first used on W and has now been successfully applied to U, Be, and Zr. The method has less tendency to deform the surface than does the usual polish procedure or the electrolytic method. In addition, there is a considerable saving in the length of time necessary for the preparation of the samples plus the advantage of extreme simplicity of operation. The polished surfaces

obtained by this method are free from disturbed material and, as viewed under high magnification, they give excellent definition of voids, inclusions, grains, and grain boundaries. In addition, it is possible to examine the specimens on the edges if so desired.

2168

APPARATUS AND TECHNIQUE FOR MEASURING THERMAL CONDUCTIVITY OF POWDERED MATERIAL. W. Z. Girton and J. H. Potter. ASTM Bull., 47-52(1951) Feb.

Work on the development of apparatus and technique for measuring thermal conductivity of powdered material is reported. Dry, powdered material was placed in the annular space between two concentric cylinders. The flow of heat was radially outward, and the quantity of heat was measured by the temperature rise of the cooling water surrounding the outer cylinder. Guard rings were used to minimize end effects. The powdered material was examined for dryness, particle size, and apparent density. The powder was compacted in the test annulus by impressing a vibration of known amplitude and frequency upon the test cell for a specified time. Tests were made with samples of powdered zinc, carbonyl iron, copper–copper oxide eutectic, and calcium carbonate. Four runs were made with each type of powder to establish the reproducibility of the method. (auth)

2169

ATTEMPTS TO ELECTRODEPOSIT ZIRCONIUM. M. L. Holt, J. Electrochem. Soc. 98, 33c-35c(1951) Mar.

Attempts were made to electrodeposit Zr and, in some cases, Zr alloys from numerous aqueous and nonaqueous solutions. None of the solutions used gave a weighable electrodeposit of pure Zr, but some solutions gave thin cathode deposits which contained Zr and Fe. No work with fused salt baths for Zr is included.

2170

THE DISSOCIATION OF BERYLLIUM IODIDE IN PLATINUM CONTAINERS. Bernard Kopelman and Harry Bender. J. Electrochem. Soc. 98, 89-93(1951) Mar.

Equilibrium measurements have been made of the dissociation of BeI_2 within the temperature range of 575 to 1060°C in Pt containers. The measurements were only partly successful because of reaction of the BeI_2 vapor with the Pt. Under equilbirium conditions, BeI_2 vapor will not decompose into its elements to any measurable extent at temperatures up to 1200°C. The dissociation constants and heat of dissociation of dimeric BeI_2 into its monomer have been determined. See also AEC report AECU-1028. 11 references. (auth)

2171

ELECTRODEPOSITION OF RHENIUM-NICKEL ALLOYS. L. E. Netherton and M. L. Holt. J. Electrochem. Soc. 98, 106-9(1951) Mar.

The electrodeposition of Re-Ni alloys from an ammoniacal citrate bath and from Ni plating baths containing $KReO_4$ is described. The ammoniacal citrate bath was used to determine the effects of such factors as bath composition, bath pH, bath temperature, and current density on cathode current efficiency and alloy composition. A plating solution which gave a cathode deposit with a high percentage of Re contained 56 g/liter of $NiSO_4 \cdot 6H_2O$, 10g/liter of $KReO_4$, 66 g/liter of citric acid, and NH_4OH to a pH of about 8. When this solution was electrolyzed at 5 amp/dm^2 and 70°C it gave a cathode deposit containing approximately 78% Re with a cathode current efficiency of about 90%. Some of the properties of electrodeposited Re-Ni alloys are also reported. (auth)

2172

ELECTROLYTIC SEPARATION OF ZIRCONIUM; trans. from Zhur. Priklad. Khim., Vol. XIX, No. 8, 1946. V. A. Plotnikov and E. B. Gitman. Sept. 12, 1950. 5p. (NP-2232; OO-W-13457)

Results of an investigation are reported of the effects of temperature and current density at the cathode on the quality of Zr deposit separated electrolytically from the following mixtures: $AlCl_3$-KCl-NaF-ZrO_2; 2KF-ZrF_4; KCl-NaCl-K_2ZrF_6; KCl-NaCl-NaF-ZrO_2; and $ZrCl_4$-NaCl. For purposes of comparison it is mentioned that chemical reduction of ZrO_2 results in highly dispersed black powders which are contaminated by oxides, carbides, nitrides, etc. Purer powders are obtained by reducing $ZrCl_4$ or K_2ZrF_6 with alkali metals.

2173

AN EXPERIMENTAL AND THERMODYNAMIC INVESTIGATION OF THE HYDROGEN-TITANIUM SYSTEM. A. D. McQuillan. Proc. Roy. Soc. (London) 204A, 309-23(1950) Dec. 22.

The temperature-pressure-concentration relationships of the hydrogen-titanium system have been studied, and its more important thermodynamic aspects have been considered. Part of the equilibrium diagram has been established, and free-energy curves for the α and β solutions have been plotted for a number of temperatures. The experimental results have been used to obtain values for the latent heat of the $\alpha \rightleftharpoons \beta$ transformation and the transformation temperature. (auth)

2174

GALLIUM, A BYPRODUCT METAL. A. P. Thompson and H. R. Harner. J. Metals (N. Y.) 191, 91-4(1951) Feb.

A brief report on uses, occurrence, properties, etc., of Ga is presented. A flowsheet of a process used to recover Ga from lithopone plant residues and a table of physical constants are included.

2175

Office of Naval Research, London
METALLURGICAL RESEARCH AT THE UNIVERSITY OF BIRMINGHAM. B. D. Cullity. Sept. 6, 1950. 5p. (ONRL-95-50)

Some of the current investigations in the Metallurgy Department, University of Birmingham, are described. These investigations include studies of the effect on yield point in certain metals, of the presence of different solute atoms,

a study of alloys of Al with transition metals, and x-ray investigations of cold-worked Al. (auth)

2176

OXIDATION OF VAPORIZATION-DEPOSITED Al-Mg AND Al-Ag ALLOYS IN VACUUM. II. A. Boettcher. Z. angew. Phys. 2, 249-51(1950) June. (In German)

Al – Mg and Al – Ag alloys were deposited from their vapors in a vacuum and heat-treated. Electron-diffraction studies were made of the oxidation of the alloys when annealed at 10^{-4} mm Hg at various temperatures. 6 figures.

2177

THE RELATIONSHIP BETWEEN ORIENTATION, GRAIN SIZE, AND BRIGHTNESS IN NICKEL ELECTRODEPOSITS. G. L. Clark and S. H. Simonsen. J. Electrochem. Soc. 98, 110-15(1951) Mar.

A large number of electrodeposited Ni panels deposited under varied conditions were examined by improved x-ray-diffraction techniques. Orientation and grain size were evaluated in order to determine whether or not any correlation exists between these measurable characteristics and the fundamental optical property of brightness. The x-ray grain sizes of matte, semibright, and bright deposits were found to be of the same order of magnitude, and furthermore, no correlation was found to exist between orientation of the crystals and brightness. (auth)

2178

Armour Research Foundation
RESEARCH ON THE ELEMENT SILICON AND SILICON ALLOYS; BIMONTHLY REPORT NO. 5; JULY 16 - SEPTEMBER 15, 1950. William R. Johnson and M. Hansen. Sept. 18, 1950. 25p. (NP-1923)

Silicon-rich alloy systems are described. In most cases, the experimental work has confirmed the presently accepted equilibrium diagrams, except that some evidence has been obtained that denies the existence of cobalt trisilicide, $CoSi_3$. None of the alloys and silicides made to date has shown any signs of ductility, either in fracture or in hardness. Phase relationships for alloys of various combinations of Si with V, Cr, Mn, Co, Ni, and Mo are plotted. Photomicrographs of representative specimens are presented. 34 figures.

2179

VAPOR PRESSURE OF BERYLLIUM OXIDE. N. D. Erway and R. L. Seifert. J. Electrochem. Soc. 98, 83-8(1951) Mar.

The vapor pressure of BeO has been measured by a modification of the Knudsen effusion method, utilizing radioactive Be^7 as tracer. In the experimental temperature range of 1950 to 2150°C the vapor pressure is given by the equation

$$\log_{10} P_{mm} = 18.50 - 34{,}230/T - 2 \log_{10} T$$

The boiling point of liquid BeO is estimated to be 4120 ± 170°C, with a molar entropy of vaporization at the boiling point of 25.6 ± 2.7 cal/deg. Similar results, except for slight numerical variations, have been reported in an AEC declassified report of the same title, MDDC-1030.

MINERALS AND MINERALOGY

2180

Battelle Memorial Inst.
FINAL REPORT; THE SEPARATION OF ZIRCONIUM AND HAFNIUM. James F. Shea, et al. June 30, 1949. Decl. June 2, 1950. 34p. (AECD-2979; BMI-JDS-202)

Petrographic, x ray, and analytical studies were made on synthetic and natural Zr minerals containing varying amounts of Hf. The following results are reported: $HfSiO_4$ can be synthesized. Its optical properties differentiate it from $ZrSiO_4$ and ZrO_2. It is isomorphous with tetragonal $ZrSiO_4$ with a slight shift in lattice constants and can be distinguished from $ZrSiO_4$ by x-ray diffraction methods. HfO_2 can be distinguished, petrographically, from ZrO_2, $HfSiO_4$, and $ZnSiO_4$. It is isomorphous with monoclinic ZrO_2 and was not distinguishable therefrom by x-ray diffraction methods. HfO_2 and ZrO_2 can occur in solid solution. $HfSiO_4$ and $ZrSiO_4$ also can occur in solid solution. ZrO_2 can occur in solid solution in $ZrSiO_4$. From the foregoing statements it is inferred that HfO_2 can occur in solid solution in $HfSiO_4$. The Hf in Zr ores occurs in solid solution in the Zn-bearing phase. Accordingly, strictly physical means of separation would not succeed. There is a possibility that a combination chemical-flotation procedure might prove of value in circumventing the bottleneck of chemical methods of separation. Neither optical microscopy nor x-ray diffraction methods are suitable for classifying Zr ores as to their Hf content.

2181

Atomic Energy Research Establishment
ALPHA PARTICLE ASSAY AND THE MEASUREMENT OF THE THORIUM-URANIUM RATIO IN RADIOACTIVE ORES. H. D. Peirson. Nov. 1950. 26p. (AERE-EL/R-394)

A theoretical investigation has been made of the α activity of a "deep" radioactive source containing the natural radioactive series. Two methods of determining the Th-U ratio have been developed for use in ore or mineral assays. The energy-discrimination method is simple in procedure and can take account of lack of secular equilibrium between members of a series in the radioactive sample. The β-α coincidence method, making use of the difference in the disintegration constants of RaC′ and ThC′ (Po^{214} and Po^{212}), is more complicated. Initial experimental verification of the theory has been obtained.

2182

CALCULATION OF THE INDEXES OF REFRACTION OF BILLIETITE. H. Brasseur. Bull. soc. roy. sci. Liége 19, 242(1950) May. (In French)

The indexes of refraction of billietite, $BaO \cdot 6UO_3 \cdot 10H_2O$, have been calculated by the Lorentz-Lorenz equation, using the density of 5.28 g/cc and the following molecular refractivities: $R_{BaO} = 9.04$, $R_{H_2O} = 3.8$, $R_{UO_3\parallel} = 20.4$, $R_{UO_3\perp} = 18.03$. $n_\beta \cong n_\gamma = 1.85$; $n_\alpha = 1.73$. These values are in excellent agreement with the measured indexes, and con-

firm the structural relationship between becquerelite, fourmarierite, and billietite.

2183

ROENTGENOGRAPHIC STUDY OF MASUYITE. H. Brasseur. Bull. soc. roy. sci. Liége 19, 239-41(1950) May. (In French)

Masuyite, lead uranate hydrate, is shown to have the cell dimensions a = 14.06, b = 12.06, c = 14.24 kX; the ratio of parameters is thus 1.166:1:1.181. The extinctions being (0kl) for l odd, (hk0) for h odd, and (h0l) for h + l odd, the space group is Pcna. The (001) plane is chosen parallel to the tablet surface and perpendicular to the pseudohexagonal axis. This orientation differs from that adopted by Vaes (Ann. soc. géol. Belg. (Bull.) 70, 212(1947)). As with becquerelite, fourmarierite, and billietite, the U atoms form a sub-unit of dimensions a′ = 3.515 (the a axis is thus divisible by 4 rather than 2 as with the other uraniferous minerals), b′ = 4.02, and c′ = 7.12 kX.

2184

UTAH'S NEW URANIUM MILL. John A. Butler. Eng. Mining J. 152, 56-62(1951) Mar.

Designed to treat 100 tons daily of Colorado Plateau carnotite ore, the Monticello mill now exceeds rated capacity. In essence, the mill uses a process resembling countercurrent cyanidation. Continuous leaching has been applied to carnotite ores. These are the steps: (1) crushing stock-piled ore to −10 mesh, (2) roasting ore with salt, (3) quenching calcine in hot Na_2CO_3 solution, (4) grinding to 65 mesh, (5) agitation leaching in 7 to 9% Na_2CO_3 solution, (6) countercurrent washing and filtration, (7) precipitation of U and V by H_2SO_4, and (8) purification of U_3O_8 and V_2O_5 by fusion and leaching. Details on procedures with flowsheets for a sampling plant, a roast-leach section, a precipitation and refining section, and a crushing section are included.

TRACER APPLICATIONS

2185

COBALT SELF-DIFFUSION: A STUDY OF THE METHOD OF DECREASE IN SURFACE ACTIVITY. R. C. Ruder and C. E. Birchenall. J. Metals (N. Y.) 191, 142-6(1951) Feb.

The method of decrease in surface activity was used to determine the rates of diffusion of Co^{60} into Co and into Ni. Since the absorption curves for Co radiation were quite complex under the conditions of these experiments, the effects of geometry and surface preparation on the diffusion results were investigated. Equations for Co self-diffusion coefficients and for dilute Co diffusing in Ni are expressed.

PHYSICS

2186

Columbia Univ.
PROGRESS REPORT FOR APRIL, MAY, JUNE, 1950. J. R. Dunning, Director. Aug. 17, 1950. 29p. (CUD-56)

Brief reports on neutron-velocity spectrometer-transmission measurements, neutron-scattering experiments, relative efficiencies of various phosphors for equal volumes of phosphors, separation of Rb^{86} from Cs^{137}, instrument development, and light-particle investigations are presented.

2187

Radiation Lab., Univ. of California
SUMMARY OF THE RESEARCH PROGRESS MEETING OF AUGUST 24, 1950. Henry P. Kramer. Sept. 14, 1950. 6p. (UCRL-905)

Inasmuch as x rays are polarized when leaving an electron-bombarded cathode and when scattered through 90 deg, a study was made of the possibility of obtaining polarized γ rays by comparable means. The Klein-Nishina formula indicates that the effect would be undetectable in scattering. There remains the possibility of polarization in the γ-ray beam produced by the synchrotron (action of highly accelerated electrons on nuclei).

COSMIC RADIATION

2188

COSMIC RAYS. P. S. Gill. Science and Culture 16, 298-300(1951) Jan.

A brief review of the field of cosmic-ray investigation, with special emphasis on the contributions made by Indian workers, is presented. Work with ionization chambers, G-M counters, cloud chambers, and photographic emulsions is described. High-altitude studies in India to test the theory that cosmic rays are originally produced by the annihilation of atoms present in interstellar space and subsequent developments are reviewed.

2189

AN INCREASE OF THE PRIMARY COSMIC-RAY INTENSITY FOLLOWING A SOLAR FLARE. Martin A. Pomerantz. Phys. Rev. 81, 731-3(1951) Mar. 1.

An increase of 15.4 ± 4.3% has been detected in the intensity of cosmic rays at altitudes between 95,000 and 100,000 ft, occurring approximately 19 hr after the commencement of the outstanding solar flare of May 10, 1949. The observations were conducted with a quadruple-coinci-

dence counter train inclined at a zenith angle of 60 deg, and containing an interposed absorber of 1 cm of Pb. Complications introduced by atmospheric absorption, possible directional asymmetry, and multiplicative effects preclude a precise evaluation of the increase in terms of absolute primary particle intensity. The effect of the particles emitted by the sun during the chromospheric eruption does not manifest itself at altitudes below approximately 55,000 ft. (auth)

2190

THE LATITUDE EFFECT OF COSMIC-RAY NEUTRONS. W. P. Staker, M. Pavalow, and S. A. Korff. Phys. Rev. 81, 889-90(1951) Mar. 1. (Letter to the editor)

In order to study the neutrons produced at high altitudes by cosmic radiation, a set of balloon flights was carried out during August 1950, from a point whose geomagnetic latitude is approximately 69°N. The counting rates of neutron counters, filled with enriched and with depleted BF_3, were obtained up to an altitude of 62,000 ft. The counting rates derived from these flights, along with data obtained farther south, is presented. It was found that the counting rate at 69°N was 2.1 ± 0.2 times that obtained at 55°N geomagnetic latitude.

2191

LATITUDE EFFECTS ON THE DENSITIES OF COSMIC-RAY STARS PRODUCED IN SENSITIVE EMULSIONS. Max Morand, Charles Beets, and Léon Winand. Compt. rend. 231, 851-3(1950) Oct. 23. (In French)

Ilford C_3 + B plates have been exposed at an altitude of 1600 m at 4°S and at 4500 m at 3°S geomagnetic latitude. The observed density of stars with more than three branches and the mean free path of the incident radiation have been compared with values found at 49°N geomagnetic latitude. Although at 1600 m no latitude effect on the density was found, at 4500 m the density varied from 8.25 ± 0.8 stars/cm^3 at 3°S to 15.5 ± 1.5 stars/cm^3 at 49°N. These values lead to the respective mean free paths of 215 and 154 g/cm^2. An interpretation of this effect is suggested.

2192

THE NATURE OF THE PENETRATING PARTICLES IN EXTENSIVE AIR SHOWERS. D. D. Millar. Proc. Roy. Irish Acad. 54A, 115-23(1951) Feb.

Tests have been made on the nature of penetrating particles in extensive air showers by utilizing an arrangement whereby various substances, such as lead, brick, etc., could be mounted as a roof over a shielded tray with appropriate counter arrangements. Results showed no evidence for the existence in the extensive air showers of unstable penetrating particles produced locally in the first few centimeters of lead.

2193

THE NATURE OF THE PENETRATING PARTICLES IN AIR SHOWERS. L. Jánossy and C. B. A. McCusker. Nuovo cimento (9) 6, No. 3 (Suppl.) 1-3(1949). (See also NSA 3-734)

Figures presented show that the results reported previously under the same title as above (Nature 163, 181-3(1949) Jan. 29) were erroneous and that there is thus no evidence as to the existence of short-lived particles as far as previous experiments are concerned. It is concluded that, although there is no evidence against the existence of λ mesons, there is no evidence to support such a hypothesis. Investigations to clarify further the appearance of local groups of particles in air showers were carried out. Preliminary results are reported.

2194

OBSERVATION OF COSMIC RAYS WITH PHOTOGRAPHIC EMULSIONS. II. Kiichi Kimura, Kazunori Yuasa, Ryutaro Ishiwari, and Senzo Tokunaga. Bull. Inst. Chem. Research Kyoto Univ. 22, 70(1950) Sept. (Abstract of paper presented at meeting of Institute, June 10-11, 1950)

Two sorts of stars are indicated as being observed in photographic emulsions, i.e., those whose branches are 20 to 40 μ, similar to those caused by RdTh (Th^{228}) or Ra, etc., and those clearly originated by cosmic rays. Methods of grain counting to determine the mass of single tracks and measurement of the scattering angles of the tracks in the coulomb field of the mass determination are mentioned.

2195

ON THE THEORY OF A NUCLEON CASCADE. H. Messel. Dublin, The Dublin Institute for Advanced Studies, 1951. 103p. (Communication Series A, No. 7)

Following an introductory chapter, Chapters II and III consider the development and fluctuation of a nucleon cascade in homogeneous nuclear matter and a finite absorber, respectively. The fundamental equations of a nucleon cascade are developed from the so-called "G-equation approach," and analytical expressions are obtained for both the average numbers and mean square deviation. The solutions are for a single incident primary nucleon. Protons are not distinguished from neutrons, only the sum — protons plus neutrons — is considered. Ionization losses are neglected. A comparison between theory and experiment is carried out in Chapter IV, on the assumption that the primary radiation can be expressed by a differential power-law spectrum with an exponent equal to 2.7. The agreement between theory and experiment is found to be promising. In Chapter V the fundamental equations of a nucleon cascade including ionization loss are developed, and complete solutions for the average numbers are obtained, satisfying the correct boundary conditions. Protons are distinguished from neutrons, and their ratio is given. A number of examples showing the effect of ionization loss are computed. Chapter VI gives a final comparison between theory and experiment. It is found that the theory developed can account very well, from a qualitative point of view, for the observed development of the nucleon component of the cosmic radiation in air. From a quantitative standpoint it is shown that the theory requires revision on several points. 42 references. (auth)

2196

PROTONS AND THE AURORA. C. W. Gartlein. Nature 167, 277(1951) Feb. 17. (Letter to the editor)

Spectrograms taken of an auroral arc indicate that hydrogen is in motion toward the earth with a mean velocity of 675 km/sec and a maximum velocity of 1350 km/sec. It is

concluded that the hydrogen is coming in from outside in the form of protons. A relation between size of the aurora and energy of the protons is suggested.

INSTRUMENTS

2197

[National Bureau of Standards]
ATOMIC ENERGY COMMISSION PROJECT ON DEVELOPMENT OF A HIGH-VOLTAGE BATTERY OF THE ZAMBONI PILE TYPE. (Based on AEC No. AV-T4) Paul L. Howard and Laurel S. Winslow. Sept. 27, 1950. 12p. (NBS-P-28(excerpt))

A study has been made of various combinations of materials for possible use in making a modified copy of the British Zamboni pile. The results of this work are summarized in tables. Both "Methocel" and carboxymethylcellulose were found to be practical as the adhesive. A number of types of MnO_2, both natural and chemical were tested. After obtaining the characteristics of cells where the composition was known, the next step was to add the corresponding metal chloride to the water to improve conductivity. Shelf tests at 90% humidity have been set up on all types of cells. This high humidity was used to accelerate the test. Others were placed on test at 30 to 40% humidity. A series of cells were made and put on discharge at 10^6 and 2.2×10^7 ohms. Results of these tests are shown graphically.

2198

Naval Research Lab.
A DEVICE FOR COMPUTING CORRELATION FUNCTIONS. A. E. Hastings and J. E. Meade. June 16, 1950. 5p. (NRL-3679)

An analogue device has been constructed for computing autocorrelation functions. On reproducing a function recorded on two channels of a magnetic tape, the spacing of two pick-ups can be varied to obtain the function delayed in one relative to the other. An electrodynamometer wattmeter indicates the average product of the two functions for any value of delay, determining the autocorrelation function. Cross-correlation of two different functions can also be calculated. Autocorrelation functions and their transforms, the power spectra, are obtained for several types of functions. A comparison of this method of obtaining power spectra with that using an ordinary Fourier analysis indicates that the latter is preferable for the particular conditions outlined. (auth)

2199

Commissariat à l'Énergie Atomique
OPERATING PARAMETERS FOR COLD-CATHODE X-RAY TUBES. P. Renaud and P. Perio. 1950. 3p. (CEA-43). (In French)

The "hardening" of cold-cathode x-ray tubes is usually ascribed to a diminution of pressure due to gas adsorptions by the tube's walls. It is found experimentally that pressure is not the only parameter whose changes determine the phenomenon in question; another factor, as yet unknown, is also responsible for it.

2200

Commissariat à l'Énergie Atomique
A PREAMPLIFIER WITH REDUCED BACKGROUND NOISE. J. Taieb. 1950. 14p. (CEA-52). (In French)

A description is given of a preamplifier in use with a mass spectrometer for rapid gas analysis, described in Report CEA-42. The instrument can be employed for amplifying any weak currents from high-impedance sources, in the frequency range 10 to 5000 cycle/sec.

2201

Atomic Energy Research Establishmend
A PULSE AMPLITUDE ANALYSER. E. W. Titterton. Dec. 1950. 5p. (AERE-G/R-620)

The possibilities of a new form of pulse-amplitude analyzer (so-called "kick sorter") are considered. Sorting is achieved on a system of electrodes located in the plane of the screen in a cathode-ray tube. Development work is in progress to assess the practicability of the method. This pulse-amplitude analyzer is the subject of U.K. patent No. 639283. (auth)

2202

Rice Inst.
STABILIZATION OF MAGNETIC FIELD BY MEANS OF PROTON MAGNETIC RESONANCE, p.25-30 of PROGRESS REPORT; NUCLEAR PHYSICS. R. D. Jones. Oct. 1, 1950. 6p. (NP-1860(p.25-30))

The possibility of utilizing the phenomenon of nuclear magnetic resonance in the stabilization of magnetic fields and the accurate determination of field strength is discussed. An instrument is described capable of stabilizing the magnetic field over a wide range of field strengths. A unique feature is the probe which occupies a very small volume and provides its own sweeping field. The physical dimensions are such that the probe can be used in a narrow gap annular magnet used for the determination of particle energies.

ISOTOPES

2203

Oak Ridge National Lab., Y-12 Area
ELECTROMAGNETICALLY ENRICHED ISOTOPES; INVENTORY, OCTOBER 31, 1950. C. P. Keim, C. E. Normand, and Boyd Weaver. Oct. 31, 1950. 60p. (Y-681)

The isotopes which have been concentrated electromagnetically, along with the completed information on their enriched abundances, and the element weights and product forms available in milligram quantities to users on Atomic Energy Commission projects and in university and industrial laboratories are listed.

2204

THE HELIUM-3 PROBLEM OF THE ATMOSPHERE. Paul Harteck and Volkert Faltings. Nature 166, 1109(1950) Dec. 30. (Letter to the editor)

The amount of He^3 found in the atmosphere is compared with that estimated to have been produced in the course of the

earth's history by decay of tritium and direct formation by cosmic rays. It seems likely that most of the He^3 must have left the earth. Experiments are being performed to obtain a more accurate value for the tritium content of the whole earth.

2205

THE ISOTOPIC CONSTITUTION OF GERMANIUM. R. P. Graham, J. Macnamara, I. H. Crocker, and R. B. MacFarlane. Can. J. Chem. 29, 89-102(1951) Jan.

A mass-spectrometric study of the abundances of the isotopes of Ge has been made using $GeCl_4$ and GeF_4 prepared from Ge compounds of different geological and geographical origins. Germanium has five isotopes: Ge^{70}, Ge^{72}, Ge^{73}, Ge^{74}, and Ge^{76}. Variations in the natural abundance ratios were found, to the extent of 0.7% for the Ge^{76}/Ge^{70} ratio. Calculations of the chemical atomic weight of Ge from the isotope abundance of this and of other recent mass-spectrometric studies yield values 0.03 to 0.05 units higher than the accepted one. (auth)

ISOTOPE SEPARATION

2206

SEPARATION OF GAS MIXTURES BY MASS DIFFUSION. PART I. Manson Benedict and Arnold Boas. Chem. Eng. Progress 47, 51-62(1951) Feb.

Separation of the components of a gas mixture by mass diffusion is effected by taking advantage of different rates of diffusion of its components into steam or other separating agent. Two types of apparatus may be used in this separation method, a mass-diffusion stage or a mass-diffusion column. In the stage type, the mixture to be separated is fed on one side of a mass-diffusion screen, and separating agent fed on the other. Those components with higher diffusion coefficient diffuse preferentially through the screen and are discharged with separating agent as the heads fraction of the separation; those components with lower diffusion coefficient remain preferentially in the undiffused or tails fraction of the separation. In the column type, steam or other condensable separating agent is caused to flow from one wall of the column through the mixture being separated to the other wall, where it is continuously condensed throughout the entire length of the column. The portion of the mixture being separated which is caused to flow along the wall at which the separating agent is charged becomes enriched in the components with higher diffusion coefficients; a second portion of the mixture which is caused to flow in the opposite direction along the wall at which separating agent is condensed is enriched in the components with lower diffusion coefficients. Theoretical equations are derived for the performance of both the stage and column types of mass diffusion and are applied to the separation of isotopes and the extraction of H_2 from coke-oven gas or similar industrial gas mixtures. Specific examples are given of the design of a cascade of columns and a cascade of stages, to produce 100 g/day of C^{13}, 90% pure by mass diffusion of methane into steam, starting with natural methane containing 1.06% $C^{13}H_4$. It is shown that the column type of process is the more efficient, using less diffusion screen and consuming less steam than the stage type. The main features of a mass-diffusion column to produce 90% pure H_2 from coke-oven gas containing 50% H_2 in 90% yield are described. It is concluded that the principal applications of mass diffusion will be to the separation of isotopes, and possibly, to the extraction of H_2 or He from heavier gases at places where large amounts of low-pressure steam or other condensable vapor are available.

2207

SEPARATION OF GAS MIXTURES BY MASS DIFFUSION. PART II. Manson Benedict and Arnold Boas. Chem. Eng. Progress 47, 111-22(1951) Mar.

A discussion of the separation of isotopic mixtures by a cascade of mass-diffusion stages and the extraction of H_2 from gas mixtures by either the column or the stage type of mass-diffusion process is presented. A flowsheet for a cascade of mass-diffusion stages, nomenclature for the mass-diffusion stage for isotopic and for H_2 separation, relative screen area and separating-agent consumption in stage and column types of mass diffusion, conditions in a column for separation of H_2 from coke-oven gas by mass diffusion into steam, characteristics of mass-diffusion stage for H_2 production, and related data and calculations are included.

2208

SWEEP DIFFUSION GAS SEPARATION PROCESS. PART I. Mario T. Cichelli, W. D. Weatherford, Jr., and John R. Bowman. Chem. Eng. Progress 47, 63-74(1951) Feb.

A gas separation process is described which has been given the name "sweep diffusion." In the sweep-diffusion process a readily condensable vapor is made to diffuse through a mixture of gases toward a condensing surface. This flowing vapor carries or "sweeps" toward the condensing surface those components of the gas which have lower rates of diffusion through the vapor. The bare essentials of a continuous, single-stage sweep-diffusion unit are shown. A condensable vapor and a feed gas consisting of a mixture of two or more components enter the enclosure, one surface of which (in this case, the bottom) is cold. The vapor diffuses through the gas mixture and condenses on the cold surface. Two product gas streams are withdrawn from the enclosure, one farther from the condensing surface than the other. The stream farthest from the condensing surface is enriched in one component of the gas mixture while the other stream is enriched in a second component whose diffusivity through the vapor is less than the first component. This second component may be said to be "less diffusible" through the vapor than the first component, and it is, in effect, carried, or "swept," to the condensing surface in greater proportion than the more diffusible component. The theoretical treatment begins with the development of equations for the concentration profiles in a single-stage sweep-diffusion process, passes on to sweep-diffusion column process, and ends with an extension of the theory of the column process to the case of the "tapered" plant. The theory has been restricted to the separation of binary perfect-gas mixtures by means of a single-sweep vapor. A single-stage separation factor, derivation of a transport equation, the column process, evaluation of a longitudinal-diffusion term, consideration of thermal diffusion, the tapered plant, etc., are discussed.

2209

SWEEP DIFFUSION GAS SEPARATION PROCESS. PART II. Mario T. Cichelli, W. D. Weatherford, Jr., and John R. Bowman. Chem. Eng. Progress 47, 123-33(1951) Mar.

Experimental work, including the comparison of theory with experiment, applications, and conclusions are described. Sectional views of sweep-diffusion columns, a summary of experimental data and results, and drawings of columns and auxiliary equipment are presented. Various theoretical and mathematical relations are indicated graphically.

2210

THE THEORY OF THE SEPARATION OF ISOTOPES BY THERMAL DIFFUSION. Sudhansu Datta Majumdar. Phys. Rev. 81, 844-8(1951) Mar. 1.

The time-dependent partial differential equation of the "separation column" of Clusius and Dickel has been solved exactly. Only an approximate solution, subject to the restriction that the fractional concentration c is everywhere small compared to unity, was known previously. The present work makes a comparison between theory and experiment possible over the full range of concentration values. (auth)

MASS SPECTROGRAPHY

2211

FOCUSING PROPERTIES OF MAGNETIC SECTOR FIELDS, WITH CONSIDERATION OF STRAY FIELDS. W. Ploch and W. Walcher. Z. Physik 127, 274-88(1950). (In German)

The stray field of magnetic sector fields employed in most mass spectrometers affects the curvature and the focusing of the ion beam. The stray field of the usual type of a magnet of a spectrometer was measured and represented graphically by lines of equal strength. Correction formulas were derived and applied in the actual work of the instrument.

2212

A MASS SPECTROMETER FOR DETERMINATION OF ISOTOPE RATIOS. E. W. Becker, E. Dörnenburg, and W. Walcher. Z. angew. Physik 2, 261-6(1950) June. (In German)

A 60-deg-magnetic-sector mass spectrometer is described in which the ions are produced by electrons oscillating in a magnetic field. The instrument gives an ion beam of about 10^{-9} amp for an abundant isotope, has relatively high resolving power ($M/\Delta M \approx 250$), and has great structural stability.

2213

A MASS SPECTROMETER FOR MONITORING CONTINUOUS PROCESSES. Charles F. Robinson, Harold W. Washburn, Clifford E. Berry, and George D. Perkins. Instruments 24, 221(1951) Feb.

A mass spectrometer developed specifically for industrial process monitoring is described. The instrument is sharply different from analytical instruments in that it records only a limited number of preselected mass peaks, and in that the instrument periodically standardizes itself against a sample of known composition in such a way that the three selected peaks are automatically brought to predetermined levels on this standard sample. The peaks may be recorded at widely different sensitivities if desired. Record presentation is such that even an untrained operator is immediately warned of instrument malfunction should it occur. The instrument is equipped with a vapor-tight pressurized case and with adequate interlocks to protect the instrument against various failures. Maintenance requirements are moderate, and the instrument has been very successful in preliminary tests. (auth)

2214

NEGATIVE IONS OF RUBIDIUM AND CESIUM; trans. from Doklady Akad. Nauk S.S.S.R. 68, 31-2(1949). V. M. Dukel'skii, E. Ya. Zandberg, and I. I. Ionov. 1949. 5p. (NP-2238)

Existence of negative ions of Rb and Cs was established by mass-spectroscopic investigation of ions formed in discharges in RbCl and CsCl vapors. Tabular data are given on mass determination for all lines in the negative-ion spectrum with reference to the Cl^{35} line. The existence of $RbCl^+$, Rb_2Cl^+ and Cs_2Cl^+ ions in all possible isotopic combinations was established.

MEASURING INSTRUMENTS AND TECHNIQUES

2215

AN ALPHA PARTICLE COUNTER FOR STUDENTS' EXPERIMENTS. R. L. Woolley. Electronic Eng. 23, 105-7 (1951) Mar.

The apparatus described is for honors students' use in studying the α activity of ThC (Bi^{212}) and its products. It is described as convenient for this purpose as it is robust and stable, and its controls are simple. It can be constructed entirely from standard radio equipment, with large tolerances on almost all components, and very little trimming of component values is required. An ionization chamber and amplifier are built in one unit and the discriminator and counting-rate meter in another. In addition a cathode-ray oscillograph and a power pack giving 300 v, and 50 ma are required. A general view of the apparatus is shown.

2216

ALPHA-PARTICLE SCINTILLATIONS IN ORGANIC COMPOUNDS. B. Collinge and E. J. Robbins. Nature 166, 1109-10(1950) Dec. 30. (Letter to the editor)

Previously published information on organic luminescent materials does not enable a direct and reliable comparision of their conversion efficiencies (conversion of incident radiation energy into light energy) to be made because different types of photomultipliers have been used and not all the compounds have been investigated with similar radiation. Crystals of anthracene, stilbene, naphthalene, and numerous other fluorescent materials have been reinvestigated using the 6.04- and 8.72-Mev α particles from thorium C (Bi^{212}) and C′ (Po^{212}) and an EMI-5311 photomultiplier tube, which has a different response from the RCA-931 tube. Integral

bias curves and relative efficiencies are given. Stuides on chrysene, 2,2'-dinaphthyl, and 1,4-diphenyl butadiene are reported for the first time.

2217

APPLICATION OF PHOTOGRAPHIC EMULSION TO THE DETECTION OF FUNDAMENTAL PARTICLES. D. M. Bose. Science and Culture 16, 279-85(1951) Jan.

A review of the gradual improvements made in photographic emulsions as detectors of charged particles with different masses, charges, and velocities is presented. A preliminary account of the application of nuclear emulsion plates to the study of ionizing particles is followed by a review of some of the important stages in the application of this technique to the study of the particle constituents of cosmic rays and nuclear processes induced by them. The method of grain count in meson mass determination is described. Investigations on improved types of emulsions by C. F. Powell including mass determination of mesons are reviewed. Existence of mesons heavier than the π meson and of very heavy unstable mesons known as V particles because of the shape of their disintegration tracks are reported.

2218

AN AUTOMATIC PRESSURE STABILISING DEVICE FOR A DIAPHRAGM TYPE WILSON CLOUD CHAMBER. Ranjit Kumar Das. Indian J. Phys. 24, 466-8(1950) Oct.

An automatic electro-mechanical air-pressure stabilizing device is described. The development has been necessary for the use of a specially designed metallic diaphragm of a shallow cloud chamber. A stabilization factor of $\pm 0.02\%$ has been reached. (auth)

2219

THE BEHAVIOR OF COUNTERS WITH PURE VAPOR FILLING IN THE PROPORTIONAL AND GEIGER REGIONS. E. Fünfer and H. Neuert. Z. angew. Physik 2, 241-9(1950) June. (In German)

An abstract of this paper appeared in Proc. I.R.E. 39, 107 (1951) Jan. and is reproduced here in its entirety.

The variation of pulse height with tube voltage was measured for various vapors, and for α and β radiation. Counters with pure vapor filling have a much more extensive proportional region than mixture-filled counters. For β radiation the limit of the true proportional region corresponds to amplification factors of 10^6 to 10^7. With heavy vapors so-called "oversize" pulses may occur.

2220

FLUORESCENT LIQUIDS FOR SCINTILLATION COUNTERS. Hartmut Kallman and Milton Furst. Nucleonics 8, 32-9 (1951) Mar.

An extensive study has provided data on relative efficiencies of many solvent-solute combinations. Response of available photomultipliers must be considered in interpreting this data. (auth)

2221

Atomic Energy Research Establishment
THE GEOMETRICAL EFFICIENCY OF AN END WINDOWED GEIGER-MÜLLER COUNTER. G. B. Cook, J. F. Duncan, and M. A. Hewitt. July 1950. 13p. (AERE-C/R-552)

In the preparation of a source for radioactive counting, uneven distribution of material on the sample tray is of frequent occurrence. In order to assess the extent of the error from this cause involved in radioactive counting with an end-window G-M counter, the efficiencies of detection of point sources situated at various positions both on and off the axis of the counter have been computed, and from this the efficiencies of detection of uniformly distributed planar sources have been estimated.

2222

THE IDENTIFICATION OF TRACKS TERMINATING IN ELECTRON-SENSITIVE EMULSIONS. Michel Renardier, Hassan Moucharafieh, and Max Morand. Compt. rend. 231, 848-9(1950) Oct. 23. (In French)

When grain counting is impossible, an identification of the ionizing particles is possible by plotting the differential curve of the gap lengths for only-slightly-inclined tracks ending in the emulsion. Four such curves plotted from tracks found on Ilford G-5 plates exposed to cosmic rays at 3469 m are shown and are attributed to proton, deuteron, and π and τ mesons. Extension of the method to tracks inclined to the emulsion is discussed.

2223

MEASUREMENT OF THE ENERGY OF ALPHA-, BETA-, AND GAMMA-RAYS BY MEANS OF A SCINTILLATION COUNTER. Sven A. E. Johansson. Arkiv Fysik 2, No. 2, 171-86(1950).

It has been previously demonstrated that if monoenergetic α particles are allowed to strike the phosphor of a scintillation counter, the pulses obtained will all be of approximately the same height. By using α particles of varying energy the pulse height was shown to be directly proportional to the energy. The scintillation counter can thus be used to measure the energy of α rays. In the present paper it is demonstrated that the proportionality between pulse height and energy also is valid for electrons and that with a scintillation counter it is possible to measure with satisfactory accuracy the energy of β and γ rays. The measurement of cosmic rays also is discussed.

2224

A NEW METHOD OF OPERATING COUNTER TUBES WITH HIGH RESOLVING POWER. A. Trost. Z. angew. Physik 2, 286-9(1950) July. (In German)

An abstract of this paper appeared in Proc. I.R.E. 39, 107 (1951) Jan. and is reproduced here in its entirety.

A method using a thyratron circuit provides direct quantitative indication of intensity even at the very high pulse rates encountered with powerful x rays or γ rays. An experimental investigation of the life of quenched counter tubes is also described.

2225

NUCLEAR EMULSION SCANNING MECHANISM. A. V. Masket and L. B. Williams. Rev. Sci. Instruments 22, 113(1951) Feb. (Laboratory and shop note)

A method of electromechanical scanning of nuclear-type photographic emulsions for tracks registered therein by nuclear particles is reported. The mechanism is said to incorporate: (1) a variable speed and range means for continuously driving the microscope in the x direction across the longer dimension of the standard 1 by 3 in. microscope slide, since most tracks will be found running across the smaller dimension; (2) a variable range coupled in focusing drive that would scan concurrently through the emulsion twice for each field of view passing the objective; (3) a means for automatically reversing the direction of scanning at each end of the scanning range; and (4) a means of projection of the field of view enabling observance of scanning without undue eye fatigue.

2226

Office of the Naval Attaché, London
ON PROCESSING NUCLEAR EMULSIONS; PART I. CONCERNING TEMPERATURE DEVELOPMENT, BULLETIN NO. 13a. C. C. Dilworth, G. Occhialini, and L. Vermaesen. 1950. 32p. (NP-1846)

This report has appeared in Bull. centre phys. nucl. univ. libre Bruxelles, No. 13a (1950) Feb. and has been abstracted in Nuclear Science Abstracts as NSA 5-1315.

2227

QUANTIZATION DISTORTION IN PULSE-COUNT MODULATION WITH NONUNIFORM SPACING OF LEVELS. P. F. Panter and W. Dite. Proc. I.R.E. 39, 44-8(1951) Jan.

It is shown that the distortion introduced in a pulse-count-modulation system due to quantization can be minimized by nonuniform spacing of levels. Equations are derived for an arrangement of nonuniform level spacing that produces minimum distortion. It is also shown that minimum distortion is significantly less than distortion resulting from uniform quantization when the crest factor of the signal is greater than four. (auth)

MESONS

2228

Radiation Lab., Univ. of California
PHOTO-MESONS FROM CARBON. (abstract). J. M. Peterson, R. S. White, and W. S. Gilbert. [nd.] 1p.

The report is reproduced here in its entirety.

The energy spectrum of negative and positive π mesons produced in C by x rays from the 330-Mev electron synchrotron in Berkeley has been measured at angles of 45, 90, and 135 deg to the beam axis, using C-2 nuclear emulsions. The C target was a sphere of 0.620-in. diam approximating a point source. The meson detection system employed completely poor geometry; the nuclear plates were imbedded in a massive cylinder of Cu surrounding the target. The minus-plus ratio has no statistically significant variation with energy; the average over energy appears to be independent of angle and equal to about 1.35($\pm$.15 at 90 and 135 deg, $\pm$0.2 at 45 deg). The energy spectra characteristically have broad maxima in the region from 30 to 70 Mev and fall to zero in the region from 100 to 150 Mev, the exact behavior depending on the angle. More mesons are emitted at 135 and at 90 deg than at 45 deg. The total cross section is about 3×10^{-28} cm^2 per nucleus per quantum.

2229

Radiation Lab. Univ. of California
POSITIVE MESONS PRODUCED BY 345-MEV PROTONS IN LIQUID HYDROGEN. (abstract). Vincent Z. Peterson. [nd.] 1p.

The report is reproduced here in its entirety.

The production of mesons in p-p collisions has been studied directly, using the photographic technique, by bombarding a liquid hydrogen target with 345-Mev protons. A "point" source having 0.002-in. Al walls contains the hydrogen, and plates imbedded in Cu absorbers are placed at various angles with respect to the beam. Earlier experiments having shown that only positive mesons are produced, a bending magnet has been interposed between target and detector to separate mesons from elastically scattered protons. Exposures made at 30 $\pm$ 1½ deg show an improvement in mesons-to-background of about 100. The sharp peak near the higher end of the meson energy spectrum, indicating a strong interaction between the outgoing nucleons, has been obtained with much better statistics. However, the energy resolution was still insufficient to determine whether or not a real deuteron is formed in the process. Further experiments at 15 $\pm$ ¾ deg designed to improve the energy resolution at the upper end of the spectrum, until limited only by the energy spread of the primary beam (~2 Mev), are now in progress and will be reported.

2230

HOW MANY MESONS? Mary Helene. Science Counselor 14, 4, 32(1951)Mar.

Investigations in which the terms π, μ, ρ, σ, longitudinal, transverse, heavy, light, fuzzy, and τ have been applied to mesons are summarized briefly. It is added that most of these types can exist in either a positive or negative state, thus increasing the possible varieties. The author states that the number can be reduced to 3 or possibly 4 different basic types of particles.

2231

ON THE SCATTERING OF π MESONS BY NUCLEONS. Maurice Jean and Jacques Prentki. Compt. rend. 231, 1036-8(1950)Nov. 13. (In French)

Studies on the interactions of the pseudoscalar meson with the nucleus (Compt. rend. 230, 365-7(1950)) are extended to the general case of spin-0 mesons. Using the symmetric theory of Kemmer and the Schwinger formalism, the differential cross sections are calculated for the cases $\pi_{scalar} - \pi_{scalar}$ and $\pi_{scalar} = \pi_{pseudoscalar}$. A single formula is obtained in which is expressed, in the center-of-gravity system, all possible cases of scattering compatible with the law of conservation of charge. Various approximations are considered.

NEUTRONS

2232

Metallurgical Lab., Univ. of Chicago
INTRODUCTION TO DIFFUSION-THEORY AND TO PILE-THEORY. Karl K. Darrow. Oct. 6, 1944. Decl. Dec. 15, 1950. 55p. (AECD-3033; CP-2475)

This critical review of present-day theory divides itself naturally into four sections: (1) diffusion theory in the narrow sense of thermal neutrons; (2) solutions of the diffusion equation for various special cases; (3) the Fermi theory of slowing-down of fast neutrons, and (4) the two-group theory with introduction to pile theory.

2233

California Univ.
VARIATION OF HIGH ENERGY NEUTRON COLLISION CROSS SECTIONS OF NUCLEI WITH ENERGY. James DeJuren. May 31, 1950. 35p.

An abstract of this report was issued and indexed as report UCRL-681 and appeared in Nuclear Science Abstracts as NSA 4-4659.

2234

Rice Inst.
THE HIGH ENERGY NEUTRONS FROM THE DISINTEGRATION OF C^{13} BY DEUTERONS, p.17-24 of PROGRESS REPORT; NUCLEAR PHYSICS. J. E. Richardson. Oct. 1, 1950. 8p. (NP-1860(p.17-24))

An excitation curve for the 5-Mev neutrons resulting from C^{13} bombarded by Van de Graaff accelerated deuterons has been obtained for neutrons emitted at 0 ± 28 deg to the direction of the deuteron beam. The curve covers deuteron energies from 200 kev to 2.1 Mev. Resonances in the yield were observed at deuteron energies of 0.6, 0.9, 1.55, and 1.80 Mev with half widths of 0.1, 0.4, 0.1, and 0.5 Mev, respectively. These correspond to excited states in the intermediate N^{15} nucleus of 16.7, 16.9, 17.47, and 17.69 Mev. (auth)

2235

Commissariat à l'Énergie Atomique
MODULATION OF THE NEUTRON FLUX IN A PILE REFLECTOR BY THE ACTION OF ABSORPTION AND DIFFUSION. V. Raievski and J. Yvon. 1950. 3p. (CEA-55)

This material appeared in Compt. rend. 231, 345-7(1950) July 31 and was abstracted in Nuclear Science Abstracts as NSA 5-210.

2236

NEUTRON DECAY: THE PROBLEM AND THE EXPERIMENTS. Arthur H. Snell. Nucleonics 8, 3-13(1951)Mar.

Postulation of the neutron's radioactivity motivated a long series of experiments, which are reviewed, to verify the theory and to measure neutron half-life. To date, measurements at Oak Ridge and Chalk River indicate a half-life in the range 8 to 30 min. A sketch of experimental apparatus by Alvarez and Tobias, photograph of the detecting end of the Alvarez–Tobias apparatus, sketch of apparatus used by J. M. Robson for detection of neutron decay, drawing of ORNL neutron-decay apparatus, photograph of the detecting system for the ORNL experiment, and a preliminary β-ray spectrum of the neutron presented as a Kurie plot are included.

NUCLEAR PHYSICS

2237

INTRODUCTORY NUCLEAR PHYSICS. David Halliday. New York, Wiley; London, Chapman and Hall, 1950. 558p.

Chapters on the following are included in this textbook on nuclear physics: basic nuclear concepts, α and γ emission; electrons in disintegration processes; interaction of charged nuclear radiations and photons with matter; detection of charged particles and photons; neutrons—production, detection, and interaction with matter; nuclear masses, mass numbers, and mass abundances; nuclear forces; charged particle accelerators; nuclear reactions; nuclear fission; cosmic rays; and nuclear spin and magnetism.

2238

Rice Inst.
PROGRESS REPORT; NUCLEAR PHYSICS. Oct. 1, 1950. 40p. (NP-1860)

Separate abstracts have been prepared on the following sections of this report: Preparation of Thin Tritium Targets, p.1-4; Gamma Rays from $Be^9(\gamma,n)$, p.5-16); The High Energy Neutrons from the Disintegration of C^{13} by Deuterons, p.17-24; Stabilization of Magnetic Fields by Means of Proton Magnetic Resonance, p.25-30.

NUCLEAR PROPERTIES

2239

BINDING ENERGY OF THE TRITON. Tsi-Ming Hu and Kung-Ngou Hsu. Proc. Roy. Soc. (London) 204A, 476-8 (1951)Jan. 9. (See also NSA 4-5006)

The variation method is employed to calculate the binding energy of the triton assuming charge-independent, two-body, Yukawa-shape interactions between nucleons in which tensor forces are included. More complete trial wave functions are used than employed hitherto in such calculations, and it is found that an interaction of Yukawa shape with constants adjusted to fit the observed data on the binding energy, quadrupole moment, and magnetic moment of the deuteron, the low-energy and high-energy scattering of neutrons by protons, the photodisintegration of the deuteron, and the coherent scattering of slow neutrons gives an approximately correct binding energy for the triton. Calculations are also carried out with interactions of the same type but with different constants. The exchange character of the forces remains unimportant. It is confirmed that the difference in the binding energies of H^3 and He^3 can be ascribed to the effect of coulomb repulsion between the protons in the latter nucleus. The wave functions found are

used to compute the magnetic moments of the two nuclei, but they do not contain sufficient admixture of P component to explain the observed values. (auth)

2240

THE SPIN OF Be^9. N. A. Schuster and G. E. Pake. Phys. Rev. 81, 886-7(1951)Mar. 1. (Letter to the editor)

Experimental evidence has been obtained from the studies of the Be^9 nuclear magnetic resonance in a single crystal of $BeAl_2O_4$, indicating that the spin of Be^9 is ½. Be^9 resonances, two of which are shown, were obtained with a recording r-f spectrometer at a number of orientations of the $BeAl_2O_4$ crystal in the magnetic field of about 7300 gauss. The observed resonances offer reasonably unambiguous evidence that the spin of Be^9 is definitely ½.

NUCLEAR TRANSFORMATION

2241

Radiation Lab., Univ. of California
CALIFORNIUM ISOTOPES FROM BOMBARDMENT OF URANIUM WITH CARBON IONS. A. Ghiorso, S. G. Thompson, K. Street, Jr., and G. T. Seaborg. Sept. 6, 1950. 3p. (UCRL-895)

Small pieces of natural U metal were irradiated in the internal carbon-ion beam in the Berkeley 60-in. cyclotron. Following the irradiations, the U was dissolved in dilute HCl containing H_2O_2, and a transplutonium fraction was isolated through the use of LaF_3 and $La(OH)_3$ precipitation steps followed by the ion-exchange adsorption column procedure in which concentrated HCl is used to separate the tripositive actinide elements from the rare-earth elements. The transplutonium fractions in HCl were evaporated as weightless films on Pt plates which were placed in the ionization chamber of the 48-channel pulse analyzer. At about 1 hr after the end of the 90-min bombardment, some 50 disintegrations of the distinctive 7.1-Mev α particles of 45-min Cf^{244} were observed to be present, presumably formed by the reaction $U^{238}(C^{12},6n)$. After the decay of the α particles due to Cf^{244}, about 5 disintegrations/min of α particles with 6.8-Mev energy was observed. This α radioactivity decayed with a half-life of about 35 hr. A consideration of α systematics leads to the view that this activity is due to the new isotope Cf^{246} formed by the reaction $U^{238}(C^{12},4n)$. The measured half-life agrees with the expected α half-life for the observed energy for an even-even isotope of the element with atomic number 98. The indicated yields for the (C,6n) and (C,4n) reactions are comparable.

2242

Radiation Lab., Univ. of California
FURTHER RESULTS CONCERNING THE GAMMA RAY SPECTRUM RESULTING FROM π^- ABSORPTION IN DEUTERIUM. (abstract) R. Lee Aamodt, Wolfgang K. H. Panofsky, and R. H. Phillips. Dec. 1950. 1p. (UCRL-1049)

The report is reproduced here in its entirety.

An improved γ-ray spectrum resulting from the process $\pi^- + d \rightarrow 2n + \gamma$ has been obtained. As the result, it has been possible to make a detailed comparison of the spectral shape with that produced by the process $\pi^- + H \rightarrow n + \gamma$, which essentially represents the spectral resolving power of the instrument. The spectrum is sensitive to the interaction of the n-n system; in particular, comparison of the experimental curves with theoretical curves calculated by K. M. Watson and R. Stuart containing the binding energy of a hypothetical dineutron as a parameter was possible. As a result, one can say that if a dineutron exists, its binding energy is less than 50 kev; it is most likely that the lowest level is virtual.

2243

EMISSION OF PROTONS FROM THE COMPOUND NUCLEUS F^{18*}. R. R. Roy. Bull. centre phys. nucl. univ. libre Bruxelles, No.21 (1950) Sept. 18p.

The emission of protons from the reaction $N^{14}(\alpha,p)O^{17}$ was studied by photographic emulsion technique. Two groups of protons were observed of Q values of about −1.16 and −2.0 Mev for E_α = 3.6 and 4.2 Mev, respectively. The experimental cross section for the (α,p) process is 0.23 ± 0.004 and 0.258 ± 0.004 barns corresponding to 3.6 and 4.2 Mev, respectively. This is in agreement with the theoretical cross section deduced from the one-level formula for l = one. The angular distribution of protons in the center-of-mass system for the two ground states has a maximum at θ = 90 deg, and for the excited states it is isotropic. (auth)

2244

EXPERIMENTS ON THE REACTION $T(d,n)^4He$. I. THE 90° CROSS-SECTION. D. L. Allan and M. J. Poole. Proc. Roy. Soc. (London) 204A, 488-99(1951) Jan. 9. (See also NSA 4-2778)

The 90-deg cross section of the reaction $H^3(d,n)He^4$ has been investigated over the energy range 100 to 200 kev (energy of bombarding triton) using a 200-kev accelerating set. Two methods have been used. As a preliminary experiment the yield of α particles from a thick heavy-ice target was measured per unit charge of incident beam, as a function of deuteron energy, and the variation of cross section deduced from the gradient of this excitation curve and the range-energy relation of tritons in heavy water. Secondly, a comparison was made between the yield of α particles from the D-T reaction and the yield of protons from the D-D reaction when a beam containing both deuterons and tritons was passed through a heavy-water-vapor target. (The energy loss in this target was calculated as only a few hundred electron volts.) To do this a simultaneous observation was made of the protons and α particles using the same counter. The values obtained for the cross section have been compared with resonance formulas given by various authors and have been found to be in disagreement with formulas of this type. From considerations of the absolute magnitude of the cross section it has been deduced that no conventional theory postulating reaction at a distance equal to the sum of the nuclear radii will be able to explain this reaction. The evidence for a low-energy resonance is thought to be inconclusive.

2245

EXPERIMENTS ON THE REACTION T(d,n)^{4}He. II. THE ANGULAR DISTRIBUTION. D. L. Allan and M. J. Poole. Proc. Roy. Soc. (London) 204A, 500-2(1951) Jan. 9.

A measurement of the angular distribution of α particles from the T-D reaction has been made by bombarding a heavy-water-vapor target with a beam of tritons. Observations were made at three triton energies, 125, 175, and 200 kev, but with high statistical accuracy only at 175 kev. In all cases the disintegration was found to take place symmetrically in center-of-mass space within the limits of experimental error. (auth)

2246

PRODUCTS OF THE HIGH ENERGY HELIUM ION AND DEUTERON BOMBARDMENT OF TUNGSTEN. S. E. Turner and L. O. Morgan. Phys. Rev. 81, 881(1951) Mar. 1. (Letter to the editor)

An investigation has been made on the radiation characteristics of radioactive species obtained by processing used exit strips from the 60-in. cyclotron of the University of California. Ta, Re, and Os fractions were separated. Activity was observed in all fractions. The total activity of Ta was identified as Ta^{182} formed by W(d,α) and W(n,p) reactions. The only active species observed in the Os fraction was Os^{185}, with a half-life of 97 days. The Re fraction, Re^{184}, had a decay curve which was resolved into two components with apparent half-lives of 50 ± 3 days and 155 ± 5 days.

2247

Pennsylvania Univ. TECHNICAL REPORT NO. 1. W. E. Stephens. Jan. 10, 1951. 57p. (NP-1930)

Separate abstracts have been prepared on the following papers of this report: Thresholds of Photo-Neutron Reactions, paper 1; Photodisintegration of Copper, paper 2; Photo Production of N^{17}, paper 3; Excitation Function of the Reaction $C^{12}(\gamma,p)B^{11}$, paper 4; and Photo-Protons from Magnesium, paper 5.

2248

Pennsylvania Univ. THRESHOLDS OF PHOTO-NEUTRON REACTIONS, paper 1 of TECHNICAL REPORT NO. 1. R. Sher, J. Halpern, and W. E. Stephens. Jan. 10, 1951. 5p. (NP-1930(paper 1))

Neutron yields as functions of the maximum energy of the bremsstrahlung output of the University of Pennsylvania betatron have been measured for several substances in the energy region from threshold to 22 Mev. The samples, of the order of 50 g of high-purity materials, were inserted in a block of paraffin in which was also placed a $B^{10}F_3$ counter. In order to avoid counting pile-up due to the x-ray pulse, and also to avoid being bothered by transient effects on the counting system due to the x-ray burst and auxiliary betatron pulses, only those neutrons were counted which, having been delayed in the paraffin, entered the counter some time after each burst of x-rays. The advantage of detecting neutrons rather than residual radioactivities is indicated by the possibility of finding (γ,n) processes whose products are either stable or have very long or very short half-lives. The results are listed. The experimental errors in most cases are ±0.3 Mev unless otherwise indicated. In addition to the new thresholds listed in the table, more than 20 thresholds were observed which had been previously reported.

2249

Pennsylvania Univ. PHOTODISINTEGRATION OF COPPER, paper 2 of TECHNICAL REPORT NO. 1. P. R. Byerly, Jr., and W. E. Stephens. Jan. 10, 1951. 5p. (NP-1930(paper 2))

The protons ejected from Cu foil irradiated with the bremsstrahlung from a 24-Mev betatron were observed in nuclear emulsions. In the process of determining the photoproton energy distribution, several anomalies suggested the possibility of the presence of photodeuterons. By grain-counting the end of the tracks, it was possible to differentiate deuterons from protons, and a considerable number of deuterons were found. Using this identification, the energy, angular distribution and relative numbers of protons, deuterons, and also α particles were determined. In a separate experiment the photoneutrons ejected from a Cu sample by 24-Mev bremsstrahlung were observed by recoils in nuclear emulsions. The neutron energy distribution is shown from these data, and the relative numbers of neutrons, protons, deuterons, and α particles ejected from Cu by 24-Mev bremsstrahlung were ascertained to be 280 : 100 : 31 : 3. The n/p ratio is in reasonable agreement with the value predicted by the various theoretical formulations of the statistical model of the compound nucleus. Further discussion is included.

2250

Pennsylvania Univ. PHOTO PRODUCTION OF N^{17}, paper 3 of TECHNICAL REPORT NO. 1. W. E. Stephens, J. Halpern, and R. Sher. Jan. 10, 1951. 18p. (NP-1930(paper 3))

The delayed-neutron activity associated with N^{17} has been produced by the x-ray irradiation of oxygen, and the reaction has been identified as $O^{18}(\gamma,p)N^{17}$. The threshold for this transmutation has been observed as 16.35 ± 0.2 Mev, and the integrated cross section has been calculated to be 0.15 ± 0.1 Mev-barns. The N^{17} was identified by measuring the neutron-activity half-life to be 4.15 ± 0.1 sec. 22 references. (auth)

2251

Pennsylvania Univ. EXCITATION FUNCTION OF THE REACTION $C^{12}(\gamma,p)B^{11}$, paper 4 of TECHNICAL REPORT NO. 1. A. K. Mann, and J. Halpern. Jan. 10, 1951. 6p. (NP-1930(paper 4))

The yield curve of the reaction $C^{12}(\gamma,p)B^{11}$ has been measured, using the University of Pennsylvania 25-Mev betatron. The data of this experiment, when combined with knowledge of the incident-photon energy spectrum, permit the calcu-

lation of the absolute total cross section of the reaction as a function of energy.

2252

Pennsylvania Univ.
PHOTO-PROTONS FROM MAGNESIUM, paper 5 of TECHNICAL REPORT NO. 1. M. Elaine Toms and William E. Stephens. Jan. 10, 1951. 23p. (NP-1930(paper 5))

The distributions in energy and in angle of the protons ejected from Mg by the bremsstrahlung x-rays of a 24-Mev betatron have been observed in nuclear emulsions. Both normal Mg and enriched Mg^{25} show a uniform angular distribution for all proton energies. The energy distribution of the protons from enriched Mg^{25} is compared to the distributions calculated from an evaporation process using various energy-level densities. Good agreement is obtained using the known Na^{24}-level densities. The integrated cross section of the $Mg^{25}(\gamma,p)$ reaction is determined as 0.056 ± 0.03 Mev-barns. (auth)

2253

THE THEORY OF THE T + D REACTION. B. H. Flowers. Proc. Roy. Soc. (London) 204A, 503-13(1951) Jan. 9.

The energy dependence and absolute magnitude of the cross section for the T + D reaction are described in terms of the exact wave functions of the coulomb field and a complex reaction length defined by the logarithmic derivative of the wave function on the reaction surface. Previous difficulties in the interpretation of the experiments are largely attributed to the failure of the WKB approximation. It is sufficient, but not necessary, to assume that the whole cross section is due to s waves; but in either case the presence of strong spin-orbit coupling is indicated. (auth)

PARTICLE ACCELERATORS

2254

CYCLOTRON AND SYNCHROCYCLOTRON. W. de Groot. Philips Tech. Rev. 12, 65-72(1950) Sept.

Following an introduction to the acceleration of particles as a mechanical problem, a description is given of the functioning of a cyclotron in which light nuclei, such as protons, deuterons, or α particles, can be accelerated up to an energy of some tens of millions of electron volts. A limit is set to the energy attainable by the fact that, owing to the magnetic induction decreasing and the mass increasing for velocities comparable to the velocity of light, at the edge of the field the resonance condition is no longer fulfilled. It is then indicated how, in the synchrocyclotron, by modulating the frequency of the accelerating field the resonance condition can, on an average, be fulfilled right up to the edge of the field, at least for a portion of the particles. As a result, at a cost of efficiency, particles can be obtained with very much higher energies than are possible with the classical cyclotron. (auth)

2255

THE DESIGN OF CYCLOTRON OSCILLATORS. John Backus. Rev. Sci. Instruments 22, 84-92(1951) Feb.

The procedure used to design the 60-in. cyclotron oscillator at Berkeley, Cal. is described. It is assumed that the cyclotron and associated circuits are oscillating on one of normal modes of vibration of the electrical circuit and the circuit is adjusted so that the proper voltages to drive the oscillator tube are obtained. The procedure is illustrated by numerical examples taken from the original design data. (auth)

2256

Atomic Energy Research Establishment
FUTURE DEVELOPMENT OF THE HARWELL E. S. GENERATOR. R. L. Fortescue and P. D. Hall. Nov. 1950. 8p. (AERE-N/R-591)

The electrostatic generator is at present limited in voltage to approximately 3 mv. This paper describes methods by which the beam energy could be increased to the region of 5 to 7 mv. Three lines of work are suggested: (a) improvement in the performance of the accelerator tubes, (b) redesign of the generator to give a column length of 17 ft instead of 9 ft, (c) operation with the present generator and an r-f "booster." Proposal (b) is a straightforward engineering project, whereas proposal (c) would require considerable development work. (auth)

2257

INSTALLATION OF A NEW MILLION ELECTRON VOLT APPARATUS. Radiography 27, 9(1951) Jan.

A brief description of the machine installed at the Mercy Hospital, Chicago includes the following points. The x radiation put out by the new machine will be equal to that of 8½ lb or $90,000,000 worth of Ra, which surpasses the output of the entire amount of Ra now available in this country. The new machine is completely self-contained, i.e., the vacuum inside the sealed tube need not be maintained by constant negative pressure applied by a pump. The grounded metal container housing is about 4 ft in diameter, 7 ft long, and complete with 1000 lb of built-in lead protection, weighs about 4000 lb. The main high light in the design of the new equipment is the fact that it has a hollow-core transformer from which the traditional iron core has been eliminated, its place being taken by the tube itself, a long, 11-section, 56-in. glass cylinder that boosts a relatively low-voltage electron stream up to 1,000,000 volts by the time it traverses the tube and strikes the target. When this high-voltage stream strikes the target, x rays are generated. A great weight reduction is made possible in the new equipment by the fact that gas is used as insulation in the transformer tank, instead of oil. About 100 lb of gas performs the insulating function of 12,000 lb of oil.

2258

Rice Inst.
PREPARATION OF THIN TRITIUM TARGETS, p.1-4 of

PROGRESS REPORT; NUCLEAR PHYSICS. A. B. Lillie and J. P. Conner. Oct. 1, 1950. 4p. (NP-1860(p.1-4))

A method of preparation of thin tritium targets is described in which tritium gas is absorbed in thin layers of Zr metal deposited by evaporation on a W disk. Targets with deposits of Zr from 10 $\mu g/cm^2$ up to 500 $\mu g/cm^2$ have been prepared having ratios of tritium atoms to Zr atoms as great as 1.5 : 1, although a ratio of 1 : 1 is the more ordinary result.

RADIATION ABSORPTION AND SCATTERING

2259

Metallurgical Lab., Univ. of Chicago
THE ENERGY OF FISSION NEUTRONS. R. F. Christy and J. H. Manley. July 31, 1942. Decl. Jan. 29, 1951. 6p. (AECD-3050; CF-209)

In the course of measuring the activity strengths of neutron sources, the spatial distribution of In or Rh resonance neutrons from small neutron sources in water has been observed. For distances r of more than ~12 cm from the source the curve $r^2A_{reg}(r)$ follows an exponential. The absorption coefficient in this exponential depends on the energy of the primary neutrons. An "effective" energy (penetration in water strongly weights neutrons of high energies) of 2.2 Mev has been determined for fission neutrons by interpolating their absorption coefficient between those for known energies.

2260

Nuclear Development Associates, Inc.
STRAIGHT AHEAD γ-PENETRATION WITH CONSTANT MEAN FREE PATH AND TWO APPROXIMATE SCATTERING FUNCTIONS. Leonard R. Solon. Oct. 20, 1950. 11p. (NYO-634)

A straight-ahead transport equation for photons (or other particles) in an absorbing and scattering medium with a unit monoenergetic source is expressed together with definitive theory. Curves on approximations to the kernel (initial energies 10 and 20 mc^2, respectively) based on a function of the Compton wavelength are presented. Tabular data on various ratios and representative values are included.

2261

MEASUREMENTS OF ABSORPTION COEFFICIENTS OF 17 MEV AND 6.1 MEV γ-RAYS IN SEVERAL ELEMENTS. Yoshiaki Uemura. Bull. Inst. Chem. Research Kyoto Univ. 22, 18-30(1950) Sept. (In Japanese)

The γ-ray absorption coefficients of Pb, Sn, Cu, and Al were measured for the 17.6-Mev and 6.1-Mev γ rays produced at the first proton resonance of the Li(p,γ) and F(p,γ) reactions, respectively. The experimental arrangement is shown. In order to obtain homogeneity of γ rays, a filter to absorb the x rays caused by proton bombardment was not used near the target, and each sample used had a diameter which was enough to cover the outside of the canalizing lead slit. Therefore, to detect the γ rays a thick lead plate was used in front of the window of a G-M counter of end-window type. The thickness of the plate was 7.5 and 5.9 mm for the 17.6-Mev and 6.1-Mev γ rays, respectively. To exclude the stray radiation, a set of canalizing lead slits and plugs was placed upon the lead counter which was housed in a large lead box. The difference of counts with and without the lead plug for each sample is taken to be the true decrement of the γ rays through the canal due to the absorption by the substance. The absorption coefficients obtained under these conditions are given as follows:

γ-ray source	Pb	Sn	Cu	Al
Li(p,γ)	0.58 ± 0.02	0.34 ± 0.01	0.28 ± 0.01	0.062 ± 0.007
F(p,γ)	0.50 ± 0.01	0.23 ± 0.01	0.27 ± 0.01	- - -

Analyzing these experimental data, the absorption due to the creation of electron pairs seems to be proportional to Z^2 in the case of the 17.6-Mev γ rays. However, it is to be noted that the absorption coefficient of Al for the 17.6-Mev γ rays is found to be larger than the theoretical value. Tables and figures are labeled in English.

2262

Carnegie Inst. of Tech.
NEUTRON-PROTON SCATTERING IN THE ENERGY RANGE OF 18 TO 21 MEV. Ewart M. Baldwin. June 10, 1950. 56p. (NP-1626)

The relative cross sections for neutron-proton scattering in the neutron energy range 18 to 21 Mev were measured by means of a proportional counter telescope at the proton laboratory recoil angles of 15 and 44° 24′ respectively. From these data a ratio of 1.06 ±15% for neutrons scattered in the center-of-mass system in the backward direction to those scattered in the sideways direction was computed. This ratio indicates nearly isotropic scattering with, perhaps, a slight preference for neutron scattering in the backward direction. (auth)

2263

Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.
NUCLEAR SHIELDING STUDIES; VII. THE EFFECT OF DUCTS ON THE ATTENUATION OF NEUTRONS AND GAMMA RAYS IN THE M.I.T. CYCLOTRON SHIELD; TECHNICAL REPORT NO. 38. J. W. Crawford, Jr., E. E. Kintner, and Clark Goodman. Sept. 27, 1950. 58p. (NP-1898)

Concrete blocks containing 6 in. ducts were used. The effects of ducts on the neutron and γ-ray attenuations in the shield were investigated. The practical results of such a study are used to assist in determining the optimum shape and position of openings and voids in shields. The particular experimental arrangement used at the Massachusetts Institute of Technology cyclotron provides data of direct value to the theoretical understanding of ducts. The use of water tanks in place of concrete allows for greater flexibility in experiments of this type. The experimental arrangement and procedures, attenuation in a solid shield, theoretical considerations of the effects of ducts in shields, and experimental results are discussed in detail.

2264

THE SCATTERING OF GAMMA-RAYS IN EXTENDED MEDIA. III. PROBLEMS WITH SPHERICAL SYMMETRY. J. Corner, F. A. G. Day, and R. E. Weir. Proc. Roy. Soc. (London) 204A, 329-38(1950) Dec. 22.

Some typical problems of the propagation of γ radiation in an extended scattering medium have been solved for pure Compton scattering, which is a good approximation for most materials at γ-ray energies up to a few Mev. The effects to be expected from air gaps around the source, large source dimensions, and plane absorbing materials are demonstrated. (auth)

2265

THE SCATTERING OF GAMMA-RAYS IN EXTENDED MEDIA. II. BACK-SCATTERING OF GAMMA-RAYS FROM A THICK SLAB. J. Corner and R. H. A. Liston. Proc. Roy. Soc. (London) 204A, 323-9(1950) Dec. 22.

The dose received by backscattering at the front face of a thick layer of scattering material irradiated by a uniform beam of γ rays has been evaluated for beam directions between normal incidence and glancing incidence, for γ-ray energies from 250 kev to 3 Mev. Results are given also for a half slab, which is useful for building up re-entrant angles by superposition, and for a right-angled corner. (auth)

RADIOACTIVITY

2266

Argonne National Lab. and Chicago Univ.
A STUDY OF THE DELAYED-NEUTRON EMITTER, Br^{87}. Andrew F. Stehney. Aug. 1, 1950. Decl. Jan. 24, 1951. 74p. (AECD-3047; ANL-AFS-1)

Analysis of the Al absorption curve of Br^{87} showed the presence of two β rays and a hard γ ray. The energies of the β rays were found to be 2.6 and 8.0 Mev, as determined by Feather analyses, with relative intensities of about 70 and 30%, respectively. A half-thickness of 19.8 g/cm^2 of Pb was found for the γ rays. Using Al absorption of secondary electrons, it was found that the most energetic γ ray has an energy of 5.4 Mev and that a larger proportion of the γ rays have energies of about 3 Mev. Coincidence measurements showed that the γ rays follow the 2.6-Mev β ray. The yield of Br^{87} in fission of U^{235} was found to be 3.5 ± 0.2%, assuming that there was no holdup in the decay of Br^{87}. An upper limit of 13 sec was set for the half-life of Se^{87}. Reduction of BrO_3^{--} with Br^- was shown to give as complete an interchange of Br^{87} and of Br^{83} with carrier Br as did reduction of BrO_3^{--} with H_2S. 57 references.

2267

Brookhaven National Lab.
THE EMISSION OF Pb X-RAYS FROM Po^{210} SOURCES. (abstract) William Rubinson and William Bernstein. [nd.] 1p. (AECU-1088)

The report is reproduced here in its entirety.

Using a proportional counter pulse analyzer (Bernstein et al., Nucleonics 6, 39(1950)) we have investigated the low-energy photons from Po^{210} sources. These were first observed by Curie and Joliot (J. phys. radium (7), 2, 20 (1931)), who interpreted them as Po L and M x radiations. By comparison of the L_α line from the Po^{210} source with the corresponding lines excited by α-particle bombardment of Tl, Pb, and Bi, and by critical absorption measurements on the L_β line, we have established that the L lines, at least, are characteristic x-ray lines of Pb. The yield, per nuclear decay is (preliminary measurement) L_α, $\sim 5.2 \times 10^{-4}$ and L_β, $\sim 2 \times 10^{-4}$, with an error of perhaps 25%. This means, assuming a Pb L fluorescence yield of ~0.5, that when a Po^{210} nucleus decays, the chance that its electronic cortege emits an L electron is ~0.1%. We will also report on the M lines from Po sources, and on the x radiations arising from the β decay of P^{32} and S^{35}, and compare these results with the theoretical predictions of Migdal (J. Phys Chem. U.S.S.R. 4, 449(1941)) and of Levinger (Thesis, Cornell University, June, 1948)).

2268

Argonne National Lab.
PROGRESS REPORT; THE DETERMINATION OF MAXIMUM ENERGY OF β RADIATION BY THE ORTHOGONAL POLYNOMIAL METHOD, p.155-63 of BIOLOGICAL AND MEDICAL DIVISIONS; QUARTERLY REPORT, NOVEMBER, DECEMBER, JANUARY, 1949-50. R. Sato and W. P. Norris. [nd.] 9p. (ANL-4401(p.155-63))

Curvilinear regression techniques employing the method of orthogonal polynomials were used to establish the empirical relationship between the activity (counts per second) of a radioactive element and energy (Mev). This method is useful in identifying an isotope by the maximum energy (i.e., intersection of empirical fitted curve with axis of energy). The E_{max} of the β-emitting P^{32} obtained from this regression analysis was 1.69 Mev.

2269

DISINTEGRATION OF $_{56}Ba^{131} \rightarrow {}_{55}Cs^{131} \rightarrow {}_{54}Xe^{131}$. Evani Kondaiah. Arkiv Fysik 2, No. 4, 295-304(1950).

The energies of γ rays from Ba^{131} have been determined from electron spectra and photospectra taken in a spectrometer. They are 122 ± 2, 206 ± 4, 372 ± 3, and 494 ± 6 kev. Intensities of γ rays and branching ratio in K-capture have been estimated from the photospectrum of Ba^{131}. $e^- - e^-$ coincidences have been investigated in a spectrograph. γ-γ coincidence rate has been found to be $(0.23 \pm 0.02) \times 10^{-3}$ per recorded γ. A probable disintegration scheme taking all the observed facts into consideration has been discussed. Internal-conversion coefficients and multipole-order nature of γ rays have been estimated. (auth)

2270

THE DISINTEGRATION OF In^{115}. Hilding Slätis, Stefaan J. du Toit, and Kai Siegbahn. Arkiv Fysik 2, No. 4, 321-32(1950). (See also NSA 4-4102)

The disintegration of 54-min In^{116} has been investigated. It decays with the emission of three β components with maximum energy 1.00, 0.87, and 0.60 Mev with relative intensities of 51, 28, and 21%, respectively. The resulting Sn^{116} emits six γ rays of 0.137, 0.406, 1.085, 1.274, 1.487, and 2.090 Mev. No γ ray at 1.8 Mev, as reported by some investigations, could be found. If existent, it would follow less than 3% of the disintegrations. A disintegration scheme is proposed which satisfies the experimental facts and the selection rules for β and γ decay. Internal-conversion coefficients were determined for 3 of the γ rays, viz., $\alpha_{0.406} = 1.0 \times 10^{-2}$, $\alpha_{1.085} = 8.4 \times 10^{-4}$, and $\alpha_{1.274} = 5.7 \times 10^{-4}$. These figures agree with those expected for electric quadrupole lines. Various coincidence experiments were performed which substantiated the term scheme proposed. 36 references. (auth)

2271

Rice Inst.
GAMMA RAYS FROM $Be^9(\alpha,n)$, p.5-16 of PROGRESS REPORT; NUCLEAR PHYSICS. James Terrell. Oct. 1, 1950. 12p. (NP-1860(p.5-16))

This section of the report has been published in Phys. Rev. 80, 1076-80(1950) Dec. 15. An abstract appeared in Nuclear Science Abstracts as NSA 5-894.

2272

HALF-LIFE OF THE LONG-LIVED Tc^{99}. Sherman Fried, A. H. Jaffey, N. F. Hall, and L. E. Glendenin. Phys. Rev. 81, 741-7(1951) Mar. 1.

The half-life of Tc^{99} has been determined on materials isolated both from fission products and from irradiated Mo. The determinations were made on aliquots of solutions prepared by dissolving weighed portions of compounds of known composition. The counts were made absolute by comparing them with Co^{60} and RaDEF standards. These determinations resulted in a value of 2.12×10^5 years for the half-life of Tc^{99}. A detailed description of the absolute β-counting techniques is given.

2273

INVESTIGATION INTO THE ANGULAR CORRELATION OF INTERNAL-CONVERSION ELECTRONS; trans. from Doklady Akad. Nauk. U.S.S.R. 68, 1029-32(1949). L. I. Rusinov and Ye. I. Chuykin. Oct. 21, 1949. 4p. (NP-2231;00-W-14511)).

An experimental investigation of the angular correlation of conversion electrons of Br^{80} is reported. Previous experiments (J. Phys. (U.S.S.R.) 3, 281(1940)) showed that the nucleus of Br^{80} transfers to its ground state in two successive transitions, both of which are strongly converted. The excitation energy of the first level $Br^{80'}$ equals 37 kev, while the second Br^{80*} is 85 kev. The general effect caused by K and L electrons of internal conversion of the first and second transitions was investigated. The experimental work is described. On the basis of the effect obtained for the angular correlation of internal conversion electrons of Br^{80*} and $Br^{80'}$, the following conclusions were made. The mechanical moment of a nucleus of $Br^{80'}$ possessing excitation energy of 37 kev is not equal to zero, since the angular dispersion of internal-conversion electrons would be isotropic if the moment of this nucleus equaled zero. The lifetime of the intermediate nucleus $Br^{80'}$ is less than 10^{-12} sec. In agreement with data on the distance between optical lines of hyperfine atomic structure, the angular moment of the nucleus after emission of the first radiation does not succeed in this time in changing its direction in space, which is a necessary condition for the discovery of a correlation. It follows from the data on the coefficients of internal conversion that the $Br^{80'}$ nucleus transfers to the ground state with doublet radiation. The nature of the radiation, however, cannot be determined from this data.

2274

Commissariat à l'Énergie Atomique
NOTE OF THE DECAY OF FISSION PRODUCTS HAVING THE SAME MASS NUMBER. J. Gueron. Bull. soc. chim. France (5), 14, 968-9(1947). (In French) 1949. 4p. (CEA-33)

The successive members of the nuclide chains arising from β decay of fission fragments may also be formed as primary fission products. Equations for the various possibilities are given, and experimental methods for distinguishing between single and multiple decay are suggested.

2275

A PRECISION DETERMINATION OF THE HALF-LIFE OF RADIUM C'. Guy von Dardel. Arkiv Fysik 2, No. 4, 337-52(1950). (See also NSA 4-6000)

The half-life of RaC'(Po^{214}) has been determined by using a 20-channel time analyzer to measure the time distribution of α pulses from a proportional counter, which contains a small radon capillary, relative to a preceding β pulse from a set of G-M counters surrounding the α counter. The value obtained for the half-life is 163.7 ± 0.2 μsec, the standard error being that due to the statistical fluctuations of the experimental points, increased by a factor of $\sqrt{2}$ in order to take account of possible unknown sources of accidental or systematic error. The value is not inconsistent with previous values obtained with the method of delayed coincidences, but seems outside the experimental errors of values obtained with the method of variable resolution. It is suggested that systematic errors may be present in values obtained by this latter method. 14 references. (auth)

2276

RADIOACTIVITY OF Ag^{111}, Cd^{111}, In^{111}, AND Sn^{111}. C. L. McGinnis. Phys. Rev. 81, 734-40(1951) Mar. 1.

By considering the 111-isobars as a unit it has been possible to specify the spin and parity of the ground states of Ag^{111}, Cd^{111}, In^{111}, and Sn^{111}, and of four excited states of Cd^{111}. The characteristics of the transitions between these levels are given. The electron spectra associated with a 5-hr In^{110}, 4.2-hr In^{109}, and 50-min In^{108} are also given. (auth)

2277

STATISTICAL STUDY OF β-EMITTING ISOTOPES. Charles Martin. Compt. rend. 231, 843-5(1950) Oct. 23. (In French)

From a study of the known properties of more than 600 known β^-, β^+, K-capture, or internal-conversion isotopes a curve has been drawn giving the number n of β emitters as a function of the logarithm of the decay period. The distribution of points thus obtained presents a maximum at T = 90 min but is not symmetric with respect to the maximum. Further statistical studies on n were carried out in analyzing the type of decay with respect to the symmetry of the curve and the parity of the nuclei involved.

THEORETICAL PHYSICS

2278

Radiation Lab., Univ. of California
COVARIANT DESCRIPTION OF A BOUND STATE. (abstract) D. L. Drukey and J. W. Weinberg. Nov. 1, 1950. 1p. (UCRL-983)

The report is reproduced here in its entirety.

The description of a bound state is formulated in interaction representation using plane wave normal modes. For this, an invariant counting technique is devised. Approximate forms of the "interaction Hamiltonian" and the resulting energy-momentum four-vector operators are obtained from a particular coupling model by application of perturbation theory and the correspondence limit. The "Schroedinger equation" takes the form of an eigenvalue equation, $P\mu\Psi = p\mu\Psi$, where $P\mu$ and $p\mu$ are respectively operator and eigenvalue, and Ψ is the state functional. In order that the $P\mu$ commute, it proves necessary that the space-like surfaces over which Ψ is defined be hyperplanes. This restriction does not destroy the covariance of the formalism, however. Solution of the Schroedinger equation may be effected by reducing from second to primary quantized form. This yields a set of integral equations with the energy and momentum of the compound system as eigenvalues. Equations for the deuteron will be presented.

2279

DEVELOPMENTS IN QUANTUM ELECTRODYNAMICS. P. A. M. Dirac. Communications of the Dublin Institute for Advanced Studies. Series A, No. 3 (1946). 33p.

Starting with a recapitulation, it is stated that quantum electrodynamics is based on analogy with classical electrodynamics. The equations of classical electrodynamics, consisting of Maxwell's equations for the electromagnetic field and Lorentz's equations for the motion of charged particles, the latter equations including terms to represent the effect of radiation damping, are mentioned in connection with precise mathematical theory. The particles are pictured as point charges for the purpose of determining their action on an electromagnetic field. This classical theory is said to be in exact agreement with the laws of conservation of energy and momentum and with the requirements of relativity and to provide a satisfactory foundation on which to continue the argumentation. The method of redundant variables, application of the theory to a single electron, the transformation law of the wave functions, and the position of a photon are covered in the discussion.

2280

IS MATTER CONSTANTLY CREATED? A. J. Rutgers. Nederland. Tijdschr. Natuurk. 16, 161-70(1950) Aug. (In Dutch)

Einstein's original differential equation of the structure of infinite space was later modified by him so as to represent a 3-dimensional spherical space of radius R. Friedman has shown that the new equation had a solution for which R is a function of the time. On the basis both of this latter view, introducing the concept of the present age t of the universe, and of the discovery of the recession of nebulae by Hubble and others, the theory of the expanding spherical universe of constant mass M was developed by Lemaître. It leads to extremely high values of the density of matter at earlier stages of the evolution of the universe, a difficulty that would not exist if it could be assumed that matter is created during the process of expansion. Certain numerical coincidences in the ratios between R, t, M, and the classical and gravitational values of the electron's radius were interpreted by Dirac (Nature 139, 323(1937)) as pointing to a constant creation of matter at a rate $dm/dt = 10^{39}$ g/sec, or 1 proton per liter every 30 billion yr. However, in a subsequent paper (Proc. Roy. Soc. (London) 165, 199(1938)) Dirac returned to the idea of a universe of constant mass. Recently, basing on a semiquantitative work by Bondi and Gold (Monthly Notices Roy. Astron. Soc. 108, 102(1948)), Hoyle (Nature 163, 196(1949); 165, 68 (1950)), by modifying Einstein's primitive equation, obtained a model of a spherical universe in which our "observable universe" is (using the language of a geometry of a space having one less dimension) bounded by a circle of constant radius, a "hoop," lying on the surface of the expanding sphere; the receding nebulae pass through the hoop and disappear from the observable universe; this loss is compensated by a continuous shower of matter (neutrons) coming from the inner of the sphere into internebular spaces within the hoop, at a rate $dM/dt = 6 \times 10^{38}$g/sec, and condensing into new cosmic bodies. Another recent theory is that of Jordan (Nature 164, 637(1949)) who sees in the supernovae the birthplace of matter.

2281

ON THE QUANTUM THEORY OF BREMSSTRAHLUNG. Gérard Petiau. Compt. rend. 231, 1038-40 (1950) Nov. 13. (In French)

A general expression is presented for the cross section corresponding to the phenomenon of bremsstrahlung in which the coulomb coupling exerted by a field C of 0- or $\hbar$-spin between two $\hbar/2$-spin particles is accompanied by the emission of a quantum of a 0- or $\hbar$-spin field C_0. Complete calculations are given for the case where C and C_0 are both pseudoscalar.

2282

PERTURBATION METHODS IN THE QUANTUM MECHANICS OF n-ELECTRON SYSTEMS. E. M. Corson. New York, Hafner Publishing Co., 1951. 308p. + xi

A survey is made on methods useful in the study of many-particle systems. After a brief review of the principles and concepts of general quantum theory, detailed attention is given to physical representation theory, perturbation theory, the antisymmetry and variation principles, the statistical method, the Dirac vector model, and the second quantization. The status and possible future usefulness of the Heisenberg S-matrix theory is discussed.

TRACER APPLICATIONS

2283

DETERMINATION OF THE AUTODIFFUSION COEFFICIENT OF MERCURY BY THE METHOD OF ISOTOPE EXCHANGES. M. Haïssinsky and M. Cotton. J. phys. radium 11, 611-14(1950) Nov. (In French)

Continuing a study of the role of autodiffusion in the exchange Hg/Hg_2^{++} (aq), (J. chim. phys. 46, 476(1949)), the authors find, with the aid of radioactive Hg^{203}, that the autodiffusion coefficient of liquid mercury at 20° is about 7×10^{-6} cm²/sec and that the activation energy of the process is 3100 cal/g-atom. Both values disagree with theory. (auth)

PATENTS

CHEMISTRY

2284

ELECTROLYTIC CELLS. K. S. Stuart and S. G. Osborne (to U. S. Atomic Energy Commission). U. S. Patent No. 2,544,285, Mar. 6, 1951.

This patent covers a compact, durable and efficient electrolytic cell for producing hydrogen and fluorine from a molten, substantially anhydrous electrolyte having the approximate composition of KF.(1.8-2)HF.

2285

METHOD OF DISSOLVING THORIUM VALUES. F. L. Steahly (to U. S. Atomic Energy Commission). U. S. Patent No. 2,546,933, Mar. 27, 1951.

Thorium metal or thorium compounds may be readily dissolved by the use of a solvent comprising nitric acid containing a small amount of certain fluorine-containing compounds.

2286

METHODS OF COATING WITH PLUTONIUM ACETYLACETONATE AND COATED PRODUCT. B. B. Cunningham, C. Smith, and J. S. Dixon (to U. S. Atomic Energy Commission). U. S. Patent No. 2,545,606, Mar. 20, 1951.

This patent describes a method for depositing a thin film of plutonium acetylacetonate on a metal article by volatilizing the plutonium compound in a vacuum and condensing it on the cooled article.

2287

THE PREPARATION OF DIBORANE. H. I. Schlesinger and H. C. Brown (to U. S. Atomic Energy Commission). U. S. Patent No. 2,544,472, Mar. 6, 1951.

A process is set forth for preparing diborane by reacting a hydride of an alkali metal with a trihalide of boron. The reaction may be accelerated by the use of an organic solvent such as ether for the boron halide.

2288

THE PREPARATION OF DIBORANE. H. I. Schlesinger and H. C. Brown (to U. S. Atomic Energy Commission). U. S. Patent No. 2,543,511ς Feb. 27, 1951.

A compound of boron and hydrogen, such as diborane, is prepared by reacting a halide of boron with an alkali or alkaline-earth metal borohydride, an alkali or alkaline-earth metal alkyl borohydride, or an alkali or alkaline-earth metal alkoxy borohydride.

2289

THE PREPARATION OF LITHIUM BOROHYDRIDE. H. I. Schlesinger and H. C. Brown to U. S. Atomic Energy Commission). U. S. Patent No. 2,545,633, Mar. 20, 1951.

Lithium borohydride is obtained by reacting lithium hydride with diborane, The presence of a solvent, such as ether, facilitates the reaction.

2290

THE PREPARATION OF URANIUM NITRIDE. A. S. Newton and O. Johnson (to U. S. Atomic Energy Commission). U. S. Patent No. 2,544,277, Mar. 6, 1951.

A method is disclosed for preparing uranium nitride by the reaction of uranium metal or uranium hydride with ammonia or nitrogen at a temperature between 200 and 400°C. The product is then calcined at a temperature substantially above 400°C to lower the nitrogen content.

2291

SULFUR-CONTAINING COMPOUNDS OF NEPTUNIUM AND A PROCESS FOR THEIR PREPARATION. S. Fried and N. R. Davidson (to U. S. Atomic Energy Commission). U. S. Patent No. 2,545,612, Mar. 20, 1951.

Sulfur-containing compounds of neptunium are prepared by contacting neptunium dioxide, neptunium hydroxide, neptunium carbonate, or a mixture thereof with a sulfiding agent such as hydrogen sulfide or carbon disulfide, at a temperature in the range of 700 to 1500°C.

2292

TRANSURANIC METAL HALIDES AND A PROCESS FOR THE PRODUCTION THEREOF. S. Fried (to U. S. Atomic Energy Commission). U. S. Patent No. 2,545,920, Mar. 20, 1951.

Halides of transuranic elements are prepared by contacting with aluminum and a halogen, or with an aluminum halide, a transuranic metal oxide, oxyhalide, halide, or mixture thereof at an elevated temperature.

2293

ZIRCONIUM-HAFNIUM SEPARATION PROCESS. K. Street, Jr. (to U. S. Atomic Energy Commission). U. S. Patent No. 2,546,953, Mar. 27, 1951.

This patent discloses a process for separating hafnium and zirconium by the use of a cationic exchange resin and selective elution therefrom.

ENGINEERING

2294

MULTIPLE CHISEL STRUCTURE FOR DISINTEGRATING AND REMOVING INCRUSTATIONS FROM INTERIOR WALLS OF RECEPTACLES. C. H. Prescott (to U. S. Atomic Energy Commission). U. S. Patent No. 2,546,700, Mar. 27, 1951.

The device is designed to remove the sublimate or incrustations from the interior of a vessel, being operable from the outside through appropriate seals.

PHYSICS

2295

APPARATUS FOR REGULATING HIGH VOLTAGE. K. G. Morrison (to U. S. Atomic Energy Commission). U. S. Patent No. 2,546,106, Mar. 20, 1951.

This patent describes a high-voltage regulator of the r-f type wherein the modulation of the r-f voltage is accomplished at a high level, resulting in good stabilization over a large range of load conditions.

2296

DETECTION OR WARNING SYSTEM. J. E. Tillman (to U. S. Atomic Energy Commission). U. S. Patent Application No. 175,529.

This patent application describes a sensitive detection or protective system capable of giving an alarm or warning upon the entrance or intrusion of any body into a defined area or zone protected by a radiation field of suitable direction and extent.

2297

FAST IMPULSE CIRCUITS. C. W. Johnstone (to U. S. Atomic Energy Commission). U. S. Patent No. 2,545,924, Mar. 20, 1951.

An improved circuit for translating the rate of occurrence of electrical impulses into a known fractional rate is obtained by the addition of cathode followers in the scaler cross-coupling paths.

2298

FREQUENCY MODULATION SYSTEMS. K. R. MacKenzie (to U. S. Atomic Energy Commission). U. S. Patent No. 2,545,623, Mar. 20, 1951.

This patent describes the use of a mechanically rotated capacitor for wobbling the oscillating frequency of a low-loss tuned-resonant line in a cyclotron accelerating system to obtain a frequency modulation over a frequency range of 3 to 1.

2299

LINEAR ACCELERATORS. L. W. Alvarez (to U. S. Atomic Energy Commission). U. S. Patent No. 2,545,595, Mar. 20, 1951.

This patent describes a linear ion accelerator employing energized wave guides in connection with spaced drift tubes capable of producing an effective ion beam of 45 Mev or more.

2300

PULSE INTEGRATING CIRCUITS. D. K. Froman (to U. S. Atomic Energy Commission). U. S. Patent No. 2,543,491, Feb. 27, 1951.

This patent covers an improved integrating circuit of the type employing capacitor build-up followed by discharge for the integration of small currents introduced within the circuit, wherein the potential difference developed in the circuit by currents to be integrated is of a low order, and does not fluctuate while the current is steady.

2301

RADIO FREQUENCY VOLTAGE SUPPLY. R. C. Dye (to U. S. Atomic Energy Commission). U. S. Patent No. 2,543,902, Mar. 6, 1951.

This patent describes a power supply source of high voltage employing a multigrid oscillator tube in which the potential on the screen grid of the tube varies with change in output load in such a manner as to provide exceptionally good stabilization of output voltage.